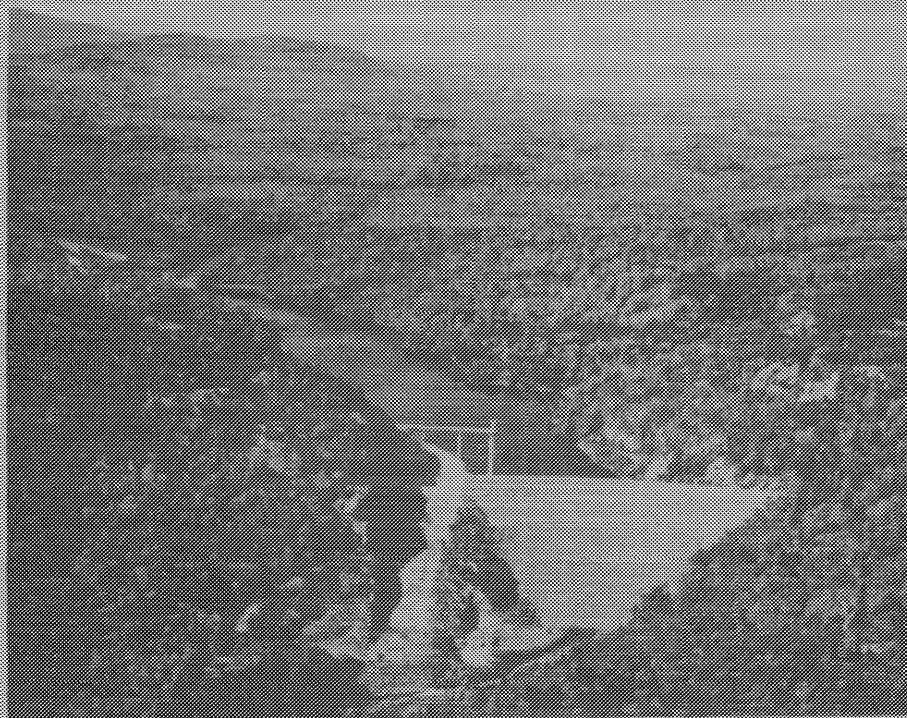


ERS

# BALL MOUNTAIN LAKE

JAMAICA, VERMONT

## OPERATION AND MAINTENANCE MANUAL



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS.

TC423  
JN43B187  
1973

JUNE 1972

OPERATION AND MAINTENANCE MANUAL

FOR

BALL MOUNTAIN LAKE

WEST RIVER, VERMONT

FEB 73

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 Trapelo Road  
Waltham, Massachusetts 02154

## TABLE OF CONTENTS

### PART I - GENERAL

Chapter 1 - Introduction	<u>Page No.</u>
a. Authority	I-I
b. Purpose	I-I
c. Parts of Manual	I-I
d. Scope of the Manual	I-I
Chapter 2 - Project Description	
a. Authorization and Location	I-I
b. Brief Description of the Project	I-I
c. History	I-4
d. List of Project Contracts	I-4

### PART II - OPERATION AND MAINTENANCE

Chapter 1 - General	
a. Scope	II-1
b. Maintenance	II-1
c. Safety	II-1
d. Regulation Procedures	II-1
e. Supervisory Responsibilities	II-1
f. Leave	II-2
g. Public Relations	II-2
h. Real Estate Outgrant Administration	II-3
i. Summary of Service Duties	II-3
j. Reports	II-4
k. Recommended List of Spare Parts and Firefighting Equipment	II-5
l. Listing of Drawings	II-7
m. Equipment and Drawing Files	II-15
Chapter 2 - Dam	
a. Slopes and Gutters	II-16
b. Interceptor Pipe Drains	II-17
c. Observation Risers	II-17
d. Inspection During Floods	II-17
Chapter 3 - Intake and Outlet Works, Retaining Walls, Buildings, Bridge, and Spillway	
a. Concrete and Masonry and Exterior Surfaces - General	II-19
b. Retaining Walls	II-20

### Chapter 3 - (Cont'd)

### Page No.

c. Trash Racks	II-20
d. Stoplog Structure	II-20
e. Log Boom	II-20
f. Tile Gages	II-20
g. Buildings	II-20
h. Bridge	II-22
j. Sump Pump	II-22

### Chapter 4 - Utilities

a. Water Supply and Sewer Systems	II-23
b. Heating and Ventilating	II-24
c. Telephone and Radio Equipment	II-25

### Chapter 5 - Roads, Grounds and Recreation Areas

a. Roads, Parking Areas, Trails and Walks	II-26
b. Traffic Services and Signs	II-27
c. Drainage	II-27
d. Guard Rails and Fences	II-27
e. Grounds	II-28
f. Change House and Comfort Stations	II-29
g. Picnic Facilities	II-29
h. Bathing Areas	II-29
i. Refuse Collection	II-29
j. Insect and Rodent Control	II-30
k. Snow Removal	II-30
l. Removal of Dead and Down Timber	II-30
m. Cutting of Wood by Others	II-30
n. Recreation Facilities	II-30

### Chapter 6 - Electrical and Mechanical Equipment

a. Hydraulic Operated Gates	II-31
b. Trolley Hoist and Elevator	II-31
c. Generators and Motors	II-34
d. Electrical Equipment	II-35
e. Sumps and Sump Pump	II-37

### Chapter 7 - Fire Prevention

a. General	II-38
b. Extinguishers	II-38
c. Testing Extinguishers	II-38
d. Fire Hose	II-39
e. Nozzles and Playpipes	II-39
f. Fire Doors	II-39
g. Flammable Waste Containers	II-39
h. Fire Warning Signs	II-39
i. Fire Plan and Emergency Instructions	II-39

Chapter 8 - Environmental Protection

Page No.

a. Scope	II-40
b. Regulations	II-40
c. Air Pollution	II-40
d. Water Pollution	II-40
e. Land Despoilment	II-40
f. Noise Pollution	II-41

Chapter 9 - Miscellaneous

a. Mobile Equipment, Tools, etc.	II-42
b. Motor Vehicle Maintenance	II-42
c. Maintenance Records	II-43
d. Snow Shoes	II-43
e. Oil Storage Tanks	II-43

INCLOSED DRAWINGS

<u>Title</u>	<u>File No.</u>	<u>Sheet No.</u>
General Plan	CT-1-4172	19
Embankment Sections	CT-1-4173	20
Outlet Works and Spillway Plan and Sections	CT-1-4176	23
Intake Tower, Plant at Elevations 1039.0, 1052.5, 1068.5 and 1085.5	CT-1-4188	35

## OPERATION AND MAINTENANCE MANUAL

### PART I - GENERAL

#### Chapter 1 - Introduction:

a. Authority. Project Operation Manual, Regulation ER1130-2-304 and Appendix I dated 25 March, 1966.

b. Purpose: This manual is to provide guidance and instruction to personnel for the proper operation and maintenance of the project facilities.

c. Parts of Manual:

Part I - General

Part II - Operation and Maintenance

d. Scope of the Manual. Scope of the manual is limited to the essential operation and maintenance instructions to operating personnel for the proper upkeep, repair, maintenance and operation of the facilities.

#### Chapter 2 - Project Description:

a. Authorization and Location. Construction of Ball Mountain Lake and Reservoir was authorized by the Flood Control Act of 1938 (Public Law 761, 75th Congress, 3rd Session) as modified by the Flood Control Act of 1941 (Public Law 228, 77th Congress, 1st Session) and the Flood Control Act of 1944 (Public Law 534, 78th Congress, 2nd Session) and 1954. The Ball Mountain Lake and Reservoir are located on the West River in the Township of Jamaica, Windham County, Vermont. It is in the southeastern part of the State, about 29 miles upstream of the confluence of the Connecticut and West Rivers at Brattleboro, Vermont and 27 miles north of the Massachusetts border. It is 2 miles north of the village of Jamaica, Vermont. It is 9.5 miles upstream of the Townshend Flood Control Dam.

b. Brief Description of the Project. The dam is a rolled earth and rock fill structure 915 feet in length with a maximum height of 265 feet above the riverbed. The top of the dam is at elevation 1,052 feet mean sea level. The dam has a side channel spillway 235 feet long at elevation 1,017 feet, m.s.l. The spillway is an uncontrolled ogee weir and chute in rock. The capacity of the reservoir at spillway crest is 54,600 acre-feet, which is equivalent to a runoff of 6 inches from the net drainage area of 172 square miles. When filled to spillway crest, the reservoir is about 5.5 miles long with a surface area of about 800 acres and a shoreline of 16.5 miles. The reservoir is operated as a unit of the comprehensive plan for flood control in the Connecticut River Basin. Pertinent data follows:

PERTINENT DATA

RIVER BASIN: Connecticut

PROJECT NAME: Ball Mountain Lake

RIVER: West River

LOCATION: Jamaica, Vermont

DRAINAGE AREA SQ. MILES: 172

RESERVOIR

Permanent Pool

Elev. ft. - m.s.l. (Stage)

Capacity - Acre Feet

- Inches of Runoff

Area in Acres

Conservation and  
Recreation Pool

Winter Pool

870. (65'±) 830 (25'±)

2,240 225

0.25 -

85 20

FLOOD CONTROL STORAGE

Total capacity - Acre Feet

Inches of runoff

Area at Crest - Acres

Length - Miles

54,600 (Flood control Storage

5.75 54,375)

800

5.5

DAM

Type

Rock and earth fill

Length - feet

Top elev. ft. - m.s.l.

Height above riverbed

DIKES

915

1,052

265

None

SPILLWAY

Type

Length - feet

Elev. - m.s.l.

Distance below to top of dam - feet

Design capacity - c.f.s.

Chute spillway located in right

Abutment

Ogee Weir

235

1,017

35

150,000

CONTROL WORKS

Type

Tunnel (circular reinforced concrete  
lined)

Size - feet	13.5 Diameter
Length - feet	942
Invert elev. - m.s.l.	805.5
Capacity - full pool - c.f.s.	11,950
Gates - Type	Hydraulic Slide
Number	3
Size	5'-8" x 10'-0"
 <u>TOTAL QUANTITIES</u>	
Embankment Volume - c.y.	2,285,000
Concrete - c.y.	26,700
 <u>TOTAL COST</u>	 \$10,585,000
 <u>OPERATIONAL DATE</u>	 September 1961
 <u>PROJECT AREA</u> - Fee (Acres)	 965
- Easement (Acres)	262
 <u>RECREATIONAL FACILITIES</u>	 Drinking water supply, 2 pkg. areas, 19 fireplaces, 28 picnic tables, 1 beach, 1 chg. house, 1 pit latrine, sanitary facilities at utility building 1
 Managed by:	 Corps of Engineers
 NO. OF PERMANENT EMPLOYEES:	 2
 RADIO CALL SIGN:	 WUA 39
 RIVER STAGE CHECKPOINTS AT:	 Jamaica, Vermont
 NO. OF GOV'T QUARTERS:	 1



c. History. (1) The basic project including access road, dam, operator's quarters and utility building, and safety fence and entrance gates was commenced in 1956 and completed in 1962.

(2) The recreation area (Windham Recreation Area) was constructed in 1963-1964.

(3) Remedial and maintenance projects now include repairs to leaks and cracks on the intake structure (1966), seeding of construction borrow areas (1967), reservoir clearing (1967), slope erosion control (1969) and painting of service bridge (1971).

d. List of Project Contracts. (1) Construction of Access Road, Jamaica, Vermont. Contract DA19-016-CIVENG-56-1334 awarded 1 April 1956 to F.A. Tucker. \$446,861.87.

(2) Construction of dam and appurtenant structures, Contract DA19-016-CIVENG-57-294, awarded 9 May 1957 to Merritt, Chapman & Scott. \$7,742,018.90.

(3) Removal of Buildings, Contract No. DA-19-016-CIVENG-58-4, awarded in summer of 1958 to Merritt, Chapman & Scott, East Hartford, Conn.

(4) Relocation of State Aid roads, Contract DA19-016-CIVENG-58-555, awarded 26 June 1958 to John W. Patterson, Jr. \$12,785.21.

(5) Access Road Repair, Contract No. DA-19-016-CIVENG-58-556, awarded in June 1958 to Machin Sand and Concrete, 349 Main Street, Greenfield, Vermont.

(6) Construction of Utility Building, Contract 60-471, awarded 20 June 1960 to Plant Supervision Corp., \$91,681.80

(7) Construction of Operator's Quarters, Contract 61-52, awarded 6 October 1960 to O'Bryan Construction Co., \$40,443.50

(8) Construction of Safety Fence and Entrance Gates, Contract No. DA-19-016-CIVENG-61-63, awarded in 1962 to Martin T. Kelly Co. Inc., Jamaica Plains, Mass.

(9) Construction of Public Use Development, Contract No. DA-19-016-CIVENG-62-187, awarded in 1963 to Warner Bros. Inc., Sunderland, Mass.

(10) Remedial Work, Intake Structures, was performed under Contract No. DA-19-016-CIVENG-65-307 in 1966.

(11) Seeding of Borrow Areas, Contract No. DACW33-67-C-0054, awarded to Transit Seeding, Inc., Mansfield, Mass., \$14,447.40

## PART II - OPERATION AND MAINTENANCE

### CHAPTER 1 - GENERAL

a. Scope. Part II of the manual covers the operating and maintenance instructions, limits, and criteria for only the major or critical project equipment and facilities and only information actually needed for the guidance of the Project Manager and others concerned with the operation and maintenance of Ball Mountain Lake, West River, Vermont by trained operating personnel. Information that is obvious for association with project equipment or available from maintenance manuals is not included. Chapter 1 is the introduction of Part II of the manual and includes miscellaneous items and supplementary information and requirements not included elsewhere.

b. Maintenance. (1) Inasmuch as mechanical and electrical equipment deteriorates more rapidly from idleness than continued use, all such equipment and facilities require periodic operation at frequent intervals. Periodic operation of equipment permits an inspection of the functioning of all parts so that defective ones may be replaced or repaired before their use is required for project operations. The performance of complete periodic maintenance routines as outlined in later chapters of this manual and in the appropriate maintenance manual for each piece of equipment will insure that the equipment is in proper running order at all times.

(2) Maintenance standards for the lake and reservoir not specifically covered in this manual will be consistent with objectives set forth in ER 1130-2-400 and the criteria established for recreation facilities in EM 1130-2-312. Facilities will be maintained at a standard that provides adequate protection for the health and safety of the public and shall meet and may exceed the health and sanitation laws of the State, county or city in which the project is located.

c. Safety. The Project Manager and his assistants shall be familiar with Corps of Engineers Safety Manual "General Safety Requirements" (EM 385-1-1 dated 1 March 1967) and shall comply with all applicable provisions.

d. Regulation Procedures. The Reservoir Control Center, Engineering Division, is responsible for regulation of flood control reservoirs. These procedures are included in the Connecticut River Basin Master Manual of Reservoir Regulation under the appendix for Ball Mountain Lake.

e. Supervisory Responsibilities. The Project Manager will, at various times, be supervising from one to several employees. He must make sure that all employees know just what is expected of them and must see that all employees carry out their duties in a workmanlike manner.

The Project Manager will plan all the work for his employees ahead of time and procure all necessary materials and equipment so that when employees get through one job they can be instantly assigned to another job. Work schedules should be set up so that work items can be completed as work conditions allow.

A good supervisor will so plan his work that one job works in well with another.

The work should be scheduled during the year so that the work to be accomplished inside of buildings may be performed in the winter months.

In the summer, the Project Manager will have a list of projects planned, both for outdoor work and indoor work. The rules and instructions set forth in this manual are for assuring that the Project Manager will have the equipment and dam in such condition that it will always be ready for emergency operation.

f. Leave. The Basin Manager shall be advised in advance whenever the Project Manager will be absent overnight from the dam or from his home. Extended annual leave will be requested from his Basin Manager. In event of emergency leave, telephone or radio contact shall be made with the Basin Manager. In all instances, the assistant Project Manager, if one is assigned to the project, will be advised the detailed information as to his location and method of contact.

g. Public Relations. Project Managers shall always bear in mind that they are representing the Corps of Engineers, U.S. Army, and that people within a radius of many miles think of them in that capacity. They must be diplomatic and careful in their statements, or they will find that observations lightly or facetiously made, are given disproportionate weight and publicity, very much to their embarrassment and that of the Division.

Project Managers are to be pleasant and courteous in their dealings with the public. They are expected to know, generally, the reasons for the main features of the dam, what purposes they serve and why they were so constructed. Project Managers are not expected to maintain "open-house" all the time at the dam to show visitors around. However, if representative groups wish to arrange to inspect the structures, the Project Manager should accompany them. If public officials or visitors having more than a curious interest visit the dam, the Project Manager will conduct them over the project and explain as much as possible the functions of the dam. He should take pride in his job, for it is a responsible one, and in his organization; the result will be public confidence in him, the structure and the organization.

Owners of adjacent property and riparian residents who may be affected by reservoir operations should be treated in a friendly and

tactful manner. Proper questions should be civilly and reasonably answered. We have nothing to hide. Explanations should be made in manner and detail as to preclude misunderstanding and subsequent criticism. Forecasting of river stages or crests or extent of damages shall be avoided. River stage forecasting is the responsibility of the U.S. National Weather Service; therefore, particular care must be exercised that comments are not construed to be river stage predictions.

h. Real Estate Outgrant Administration. The Project Manager will forward with his comments any inquiries for outgrants to the Basin Manager. He will monitor all existing outgrants, and report all irregularities to the Basin Manager.

i. Summary of Service Duties.

(1) Daily

- (a) Water surface reading from water level recorder.
- (b) Precipitation reading from rain gage.
- (c) Read and record thermometer values.
- (d) Record weather observations on U.S.W.S. Form E-14 and Form 612-14.
- (e) Clean rest and toilet rooms.
- (f) During period of flood flow check operation of all remote recorders and telemarks.

(2) Weekly

- (a) Operate stand-by unit up to operating temperature to provide power for tests.
- (b) Change weekly pool elevation and rain gage charts.
- (c) During periods of normal flows, check remote recorders and telemarks.
- (d) Clean intake structure operation and maintenance spaces.
- (e) Test run trolley hoist and elevator.

(3) Monthly

- (a) Inspect reservoir area.
- (b) Inspect battery and air filter on stand-by unit.
- (c) Inspect power and telephone lines.
- (d) Change monthly pool elevation charts and rain gage tape.
- (e) Operate engine-generator unit for two hours.

(4) Every Six Months

- (a) Inspect intake tower.
- (b) Check all concrete structures.
- (c) Change crankcase oil in stand-by unit.

(5) Annually

- (a) Check seal of gates when pool is drained.
- (b) Inspect and test life preserver vests.
- (c) Inventory of property.
- (d) Spot paint bridges.
- (e) Check condition of anti-freeze each fall in generator engines and install new or additional as required.
- (f) Winter change rain gage.

j. Reports

- (1) Daily Log. A daily log or record book will be maintained by the Project Manager. Entries should be made daily and should include notes of all activities outside of normal routine. The entries should be complete and should provide a record of all consequential events concerning the dam and reservoir area, daily 8 a.m. pool and outflow readings.
- (2) Bi-weekly gate operation and pool elevation report NED Form 90.

- (3) Monthly report of maintenance.
- (4) Monthly receiving report for electrical and telephone service.
- (5) Safety report NED 618.
- (6) Omitted.
- (7) Snow course reports as required.
- (8) Flood control observations after each operation for flood control.
- (9) Weekly hydrology report NED Form 477.
- (10) Daily river and rainfall report U.S.W.S. Form E-14.
- (11) Project monthly visitation data NED 545.
- (12) Weekly motor vehicle trip ticket NED 614.
- (13) Record of Purchases Monthly NED 236.
- (14) Quarterly fuel consumption report.

With the exception of "Daily Log" the above-listed reports and records are submitted on prepared forms which are self-explanatory.

k. Recommended List of Spare Parts and Firefighting Equipment.

Spare Parts. Each dam should have as a minimum a store of the following spare parts. An expeditious local source of supply of spare parts will suffice in lieu of storage of spare parts at the project.

(1) Electrical Generator Unit. (Per unit)

(a) Engine Diesel

1. Fuel pump
2. Two fuel injector nozzles
3. Fan belt
4. Two exhaust valves
5. Four valve springs
6. Two intake valves
7. Head gasket
8. Complete set of manifold gaskets
9. Fuel filter
10. Oil filter

(b) Generator

1. Set of brushes for exciter
2. Set of brushes for generator field
3. Two springs for exciter brushes
4. Two springs for generator field brushes

(2) Elevator and Trolley Hoists.

1. Two coils for motor starters
2. Six sets of contacts for motor starters

(3) Crane.

1. Set of brushes for wound rotor motor
2. Spare set of contacts for each magnetic starter
3. Spare coil for each motor starter

(4) Electrical.

1. Twelve fuses for every size used on job
2. 100 ft. of No. 12-600 volt wire, 2-conductor
3. Two rolls rubber tape
4. Two rolls friction tape
5. Spare floodlight bulbs
6. Fuse puller

(5) Firefighting Equipment. The dam has a portable fire pump and will keep the following standard equipment complement, stored in an easily accessible place, along with the pumper:

1. 10 batteries, (flashlight)
2. 1 small tool box
3. 1 oil can, squirt
4. 1 five-gallon can, Protectoseal, Underwriters Laboratories approved, filled with four gallons of regular gasoline
5. 1 pump backpack carrier
6. 2 starting cords
7. 2 flashlights
8. 1 2-in oil funnel
9. 1 screened funnel
10. 50 hose gaskets, 1-1/2"
11. 1 one-pound can of cup grease
12. 1 peen hammer
13. 2,000 feet of 1-1/2" linen hose
14. 2 flexible gasoline hoses
15. Omitted

16. 2 eight-feet lengths of 1-1/2" suction hose
17. 1 first aid kit, filler only
18. 1 pint oil measure
19. 2 nozzles, 1-1/2" (1 adjustable fog & 1 combination)
20. 6 quarts of oil (outboard motor oil - SAE 30 in cans)
21. 1 oil can opener
22. 1 galvanized pail
23. 1 pair of adjustable pliers
24. 2 pounds of rags
25. 1 screwdriver
26. 2 sets of sparkplugs (extra)
27. 1 suction strainer, 1-1/2" (disc type)
28. 1 5-gallon gasoline tank (empty)
29. 2 rolls friction tape
30. 1 check and bleeder automatic valve
31. 1 pressure relief valve (this may be in combination with the automatic check valve)
32. 2 bleeder valves
33. 1 Siamese valve
34. 2 Wescott type wrenches
35. 1 set of ignition wrenches
36. 1 pump wrench
37. 1 sparkplug wrench
38. 2 spanner wrenches

(3) All other spare parts recommended by manufacturers manuals.

1. Listing of Drawings. The following drawings cover the major items covered under this manual. Those indicated by asterisk are inserted at the end of Part II of the manual.

<u>Sheet No.</u>	<u>Title</u>	<u>Drawing No.</u>
	(1) CONTRACT NO. DA-19-016	
	Construction of Dam and Appurtenant Structures CIVENG 57-294	
1	Project Location & Index	CT-1-4171
2	Hydrographs No. 1	CT-3-1309
3	Hydrographs No. 2	CT-3-1310
4	Hydrographs No. 3	CT-3-1311
5	Hydrographs No. 4	CT-3-1312
6	Plan of Foundation Explorations	CT-2-1475
7	Geologic - Log Profile	CT-2-1476
8	Geologic - Log Profile (Center Line of Tunnel & River Section)	CT-2-1477
9	Geologic - Log Profile (Center Line of Spillway)	CT-2-1478



<u>Sheet No.</u>	<u>Title</u>	<u>Drawing No.</u>
10	Geologic - Log Profile (Spillway and Tunnel)	CT-2-1479
11	Record of Foundation, Exploration No. 1	CT-2-1480
12	Record of Foundation, Exploration No. 2	CT-2-1481
13	Record of Foundation, Exploration No. 3	CT-2-1482
14	General Plan of Borrow Areas	CT-2-1483
15	Plan of Borrow Explorations (Previous Borrow Areas, A, D, & F)	CT-2-1484
16	Plan of Borrow Explorations (Previous Borrow Areas, G, H, & J)	CT-2-1485
17	Plan of Borrow Explorations (Previous Borrow Areas, K, L, & P)	CT-2-1486
18	Plan of Borrow Explorations Borrow Areas, R & S)	CT-2-1487
* 19	General Plan	CT-1-4172
* 20	Embankment Sections	CT-1-4173
22	Embankment & Log Boom - Details	CT-1-4175
* 23	Outlet Works & Spillway, Plan & Sections	CT-1-4176
24	Spillway - Channel Sections	CT-1-4177
25	Spillway - Concrete Details No. 1	CT-1-4178
26	Spillway - Concrete Details No. 2	CT-1-4179
	<u>Outlet Works</u>	
27	Outlet Works - Sections	CT-1-4180
	<u>Inlet Channel</u>	
28	Concrete Details No. 1	CT-1-4181
29	Concrete Details No. 2	CT-1-4182
30	Steel Reinforcement	CT-1-4183
	<u>Intake Tower</u>	
31	Plans & Sections	CT-1-4184
32	Plan at Elevations 805.5 & 826	CT-1-4185
33	Plan at Elevation 868.0 & Section	CT-1-4186
34	Sections - Elevation 799.5 to 868.0	CT-1-4187
* 35	Plan at Elevations 1039.0, 1052.5, 1068.5, 1085.5	CT-1-4188
36	Sections - Elevations 868.0 to 1087.5	CT-1-4189
37	Manhole Details	CT-1-4190
38	Float Well & Accessories	CT-1-4191
39	Air Vents & Accessories	CT-1-4192
40	Tile Gages	CT-1-4193

<u>Sheet No.</u>	<u>Title</u>	<u>Drawing No.</u>
41	Architectural - Plans & Details	CT-1-4194
42	Architectural - Elevation, Section & Details	CT-1-4195
43	Base Slab - Steel Reinforcement	CT-1-4196
44	Gate Chamber Floor - Steel Reinforcement	CT-1-4197
45	Pier & Wall Elevations - Steel Reinforcement	CT-1-4198
46	Vertical Sections - Steel Reinforcement	CT-1-4199
47	Horizontal Sections - Steel Reinforcement	CT-1-4200
48	Gate Chamber Roof & Heater Room Steel Reinforcement	CT-1-4201
49	Circular Tower - Steel Reinforcement	CT-1-4202
50	Operating Room Floor - Steel Reinforcement	CT-1-4203
51	Equipment Room Floor - Steel Reinforcement	CT-1-4204
52	Roof Reinforcement	CT-1-4205
64	Gate Assembly, Sections & Details	CT-1-4413
65	Hydraulic Gate Control System (Piping & Equipment Arrangement)	CT-1-4414
66	Hydraulic Piping Diagram - (Gate Hanger Arrangement & Sump Pump)	CT-1-4415
67	Electrical Distribution - Plan, Profile & Detail	CT-1-4416
68	Electrical Distribution - Service Bridge Details	CT-1-4417
69	Electrical - Gate Room, Plans & Sections	CT-1-4418
70	Electrical Plans	CT-1-4419
71	Electrical Sections	CT-1-4420
72	Electrical - Wiring Diagrams & Schedules	CT-1-4421
<u>Service Bridge</u>		
73	Structural Details No. 1	CT-1-4422
74	Structural Details No. 2	CT-1-4423
75	Structural Details No. 3	CT-1-4424
<u>Access Road Extension</u>		
76	Piers & Abutment Details - Steel Reinforcement	CT-1-4425
77	Service Road - Plan & Profile	CT-1-4426
78	Details of Standard Structures	CT-1-4427
79	Miscellaneous Details	CT-1-4428
80	Sections - Station 83+00 to Sta. 84+50	CT-1-4429
81	Sections - Station 85+00 to Sta. 86+50	CT-1-4430
82	Sections - Station 87+00 to Sta. 87+33	CT-1-4431

Sheet No.TitleDrawing No.Service Road

83	Rotary & Flag Pole - Plan & Sections	CT-1-4432
84	Profile and Sections	CT-1-4433
85	Grading Building Area, Plan & Sections	CT-1-4435
86	Limits of Contractor's Work Area	CT-1-4440

(2) CONTRACT NO. DA-19-016-CIVENG 60-471

## Construction of Utility Building

1	Project Location & Index	CT-1-4633
2	General Plan, Sections & Foundation Explorations	CT-1-4634
3	Interceptor Ditch, Profile & Sections	CT-1-4635
4	Site Plan & Details	CT-1-4636
5	Water, Sanitary & Drainage Details	CT-1-4637
6	Architectural, Plans, Sections & Details	CT-1-4638
7	Architectural, Elevations	CT-1-4639
8	Architectural, Sections	CT-1-4640
9	Structural, Sections & Details	CT-1-4641
10	Mechanical, Plans & Details	CT-1-4672
11	Electrical, Plan, Section & Details	CT-1-4642

(3) CONTRACT NO. DA-19-016-CIVENG 61-52

## Operators Quarters

1	Project Location & Index	CT-1-4644
2	Plan & Record of Foundation, Explorations	CT-1-4645
3	Site Plan & Details	CT-1-4655
4	Floor Plans, Elevation & Details	CT-1-4647
5	Framing Plans, Sections & Details	CT-1-4648
6	Plumbing & Heating	CT-1-4649
7	Electrical, Plan & Details	CT-1-4650
8	Water & Sanitary Details	CT-1-4651
9	Garage	CT-1-4652

(4) CONTRACT NO. DA-19-016-CIVENG 58-555

## Relocation of State Aid Road

1	Project Location & Index	CT-1-4442
2	Survey Record & Sub-surface Ext.	CT-1-4443
3	Plan & Profile No. 1	CT-1-4444
4	Plan & Profile No. 2	CT-1-4445
5	Sections	CT-1-4446
6	Miscellaneous Details	CT-1-4447

<u>Sheet No.</u>	<u>Title</u>	<u>Drawing No.</u>
1	Relocation of Cole Pd. Rd., Plan & Profile No. 1	CT-1-5501
2	Relocation of Cole Pd. Rd., Plan & Profile No. 2	CT-1-5502
3	Relocation of Cole Pd. Rd., Typical Sections	CT-1-5503
(5) <u>CONTRACT NO. DA-19-016- CIVENG 58-556</u>		
Exist. Rd. - Repairs & Alt. from Sta. 24+50 To Sta. 29+60		
1	Plan & Details	CT-1-4451
(6) <u>CONTRACT NO. DA-19-016-CIVENG 50-23</u>		
1	Calyx Hole CH-1, Project Location & Index	CT-1-3071
2	Calyx Hole CH-1, Record of Foundation Explorations	CT-2-1440
3	Calyx Hole CH-1, General Plan	CT-1-3072
(6a)		
1	Project Location & Index	CT-1-3068
2	Jamaica Hydrographs	CT-1-1289
3	Newfane Hydrograph No. 1	CT-3-1290
4	Newfane Hydrograph No. 2	CT-3-1291
5	Record of Subsurface Explorations No. 1	CT-2-1438
6	Record of Subsurface Explorations No. 2	CT-1-1439
7	General Plan & Details	CT-1-3069
(7) <u>CONTRACT NO. DA-19-016-CIVENG 65-307</u>		
Remedial Work - Intake Tower		
1	Location Map, Sections & Index	CON-25
2	Sections	CON-25
(8) <u>CONTRACT NO. DA-19-016-CIVENG 56-1334</u>		
Construction of Access Road		
2	Plan, Profile & Sections	CT-1-4023
3	Detail of Standard Structures	CT-1-4024
4	Detail of Standard Structures	CT-1-4025

<u>Sheet No.</u>	<u>Title</u>	<u>Drawing No.</u>
5	Plan, Profile, Grading & Drainage, Sta. 0+29 to Sta. 17+50	CT-1-4026
6	Plan, Profile, Grading & Drainage, Sta. 17+50 to Sta. 34+50	CT-1-4027
7	Plan, Profile, Grading & Drainage, Sta. 34+50 to Sta. 52+50	CT-1-4028
8	Plan, Profile, Grading & Drainage, Sta. 52+50 to Sta. 70+50	CT-1-4029
9	Plan, Profile, Grading & Drainage Sta. 70+50 to Sta. 82+50	CT-1-4030
10	Subsurface Explorations	CT-2-1459
11	Cross Sections - Sta. 0+9.5 to Sta. 1+50	CT-1-4032
12	Cross Sections - Sta. 2+00 to Sta. 2+55	CT-1-4033
13	Cross Sections - Sta. 3+00 to Sta. 6+55	CT-1-4034
14	Cross Sections - Sta. 7+00 to Sta. 10+50	CT-1-4035
15	Cross Sections - Sta. 11+00 to Sta. 14+70	CT-1-4036
16	Cross Sections - Sta. 15+00 to Sta. 18+00	CT-1-4037
17	Cross Sections - Sta. 18+50 to Sta. 21+00	CT-1-4038
18	Cross Sections - Sta. 21+50 to Sta. 24+00	CT-1-4039
19	Cross Sections - Sta. 24+50 to Sta. 27+00	CT-1-4040
20	Cross Sections - Sta. 27+50 to Sta. 30+00	CT-1-4041
21	Cross Sections - Sta. 30+50 to Sta. 32+00	CT-1-4042
22	Cross Sections - Sta. 32+50 to Sta. 35+00	CT-1-4043
23	Cross Sections - Sta. 35+50 to Sta. 38+00	CT-1-4044
24	Cross Sections - Sta. 38+50 to Sta. 41+50	CT-1-4045
25	Cross Sections - Sta. 41+50 to Sta. 44+00	CT-1-4046
26	Cross Sections - Sta. 44+50 to Sta. 47+00	CT-1-4047
27	Cross Sections - Sta. 47+50 to Sta. 48+00	CT-1-4048
28	Cross Sections - Sta. 49+50 to Sta. 51+00	CT-1-4049
29	Cross Sections - Sta. 51+50 to Sta. 53+61.61	CT-1-4050
30	Cross Sections - Sta. 54+00 to Sta. 55+72	CT-1-4051
31	Cross Sections - Sta. 56+00 to Sta. 58+50	CT-1-4052
32	Cross Sections - Sta. 59+00 to Sta. 61+00	CT-1-4053
33	Cross Sections - Sta. 61+50 to Sta. 62+78	CT-1-4054
34	Cross Sections - Sta. 63+00 to Sta. 65+00	CT-1-4055
35	Cross Sections - Sta. 65+50 to Sta. 67+00	CT-1-4056
36	Cross Sections - Sta. 67+50 to Sta. 69+00	CT-1-4057
37	Cross Sections - Sta. 69+28 to Sta. 71+00	CT-1-4058
38	Cross Sections - Sta. 71+05 to Sta. 73+50	CT-1-4059
39	Cross Sections - Sta. 74+00 to Sta. 75+65	CT-1-4060
40	Cross Sections - Sta. 75+85 to Sta. 77+50	CT-1-4061
41	Cross Sections - Sta. 77+60 to Sta. 79+50	CT-1-4062
42	Cross Sections - Sta. 79+68 to Sta. 81+50	CT-1-4063
43	Cross Sections - Sta. 82+00 to Sta. 82+35	CT-1-4064
44	Cross Sections - Sta. 82+50 to Sta.	CT-1-4065

(9) CONTRACT NO. DA-19-016-CIVENG 62-187

## Public Use Development

1	Public Use Development	CT-1-4731
2	Winhall River Area, General Plan	CT-1-4726
3	Winhall River Area, Plan, Profile & Sections No.1	CT-1-4727
4	Winhall River Area, Plan, Profile & Sections No.2	CT-1-4728
5	Winhall River Area, Plan, Profile & Sections No.3	CT-1-4729
6	Winhall River Area, Sections	CT-1-4730
7	Utility Building Area, Plan	CT-1-4732

Basic Recreational Facilities

9	Fireplace & Picnic Table Anchoring, Plans, Sections & Details	NED-9-1015
10	Pit Latrine, Plan, Elevations, Sections & Details	NED-9-1016
11	Change House - Architectural Plan Elevations Sections & Details	NED-9-1018
12	Chemical Toilet - Architectural Plan, Sections & Details	NED-9-1019
13	Chemical Toilet - Structural Plan, Sections & Details	NED-9-1020
15	Feature Identification Sign, Elevation & Section	NED-9-1022
16	Guard Rail Details	NED-9-1023

(10) CONTRACT NO. DA-19-016-CIVENG 61-63

## Safety Fence and Entrance Gates

1	Project Location and Index	CT-1-4704
2	Plans and Details	CT-1-4705
3	Typical Sections	CT-1-4706

(11) CONTRACT NO. DACW33-67-C-0096

## Reservoir Clearing

1	Plan and Location Map	CON-62
---	-----------------------	--------

(12) CONTRACT NO. DACW33-67-C-0054

## Borrow Area Seeding

1	General Plan and Index	CON-59
2	Areas "K" and "S"	CON-59
3	Areas "A" and "R"	CON-59

<u>Sheet No.</u>	<u>Title</u>	<u>Drawing No.</u>
------------------	--------------	--------------------

(13) CONTRACT NO. DACW33-69-C-0124

Slope Erosion Control

1	Plans and Index	CON-81
2	Sections	CON-81
3	Culverts - Sections and Details	CON-81

(14) CONTRACT NO. DACW33-71-C-0108

Painting Service Bridge

<u>Drawing No.</u>	<u>Sheet</u>	<u>Description</u>	<u>Rev. No.</u>
--------------------	--------------	--------------------	-----------------

BALL MOUNTAIN DAM

CT-1-4171	1	Project Location and Index	3
CT-1-4184	31	Intake Tower - Plans and Sections	2
CT-1-4194	41	Intake Tower - Architectural, Plans and Details	2
CT-1-4195	42	Intake Tower - Architectural, Elevations, Sections & Details	2
CT-1-4422	73	Service Bridge - Structural Details No. 1	2
CT-1-4423	74	Service Bridge - Structural Details No. 2	2
CT-1-4424	75	Service Bridge - Structural Details No. 3	2

Reservoir

1	Aerial Survey Record	CT-5-1562
2	Aerial Survey Record	CT-5-1563
3	Aerial Survey Record	CT-5-1564
4	Aerial Survey Record	CT-5-1565
5	Aerial Survey Record	CT-5-1566
1	Reservoir Regulation Studies	Plate No. 1
2	Reservoir Regulation Studies	Plate No. 2
	Supplemental Study, Plate No. 1 1st. Alternate	
	Supplemental Study, Plate No. 2 2nd. Alternate	
1	Plaque, Sections & Details	CT-1-5646

Clearing of Construction and Reservoir Areas

1	Project Location & Index	CT-1-4103
2	Dam site and General Plan	CT-1-4104
3	Construction Sign	CT-1-4105

Sheet No.

Title

Drawing No.

TOPO for Erosion Study

1	Survey Record	SUR-60
2	Survey Record	SUR-60
3	Survey Record	SUR-60

Arch Dam Design

Goodall No. 2	113
---------------	-----

Survey Record

1 of 1	Road Relocation	CT-1-1659
1 of 2	Building Site	CT-1-1657
2 of 2	Building Site	CT-1-1658
1	Survey Record	CT-1-1597

m. Equipment and Drawing Files. This manual does not include operating and maintenance instructions and other maintenance information which are covered or included in the equipment and drawing files of the dam operator. These files include operating manuals, design memorandum, shop drawings of equipment, catalog cut and maintenance instructions, and other supplementary information. The items on file are as follows:

- (1) Milwaukee Crane - 4 parts Catalogs.
- (2) Cummings Diesel - 2 Operation and Maintenance Manuals.
- (3) Pacific Marine Pump - Instructions and Parts Manual.
- (4) Kohler Electric Plant - Operation, Maintenance and Parts Manual.
- (5) Small Engine Service Manual - 5th Edition.



## CHAPTER 2 - DAM

a. Slopes and Gutters. (1) Slopes (Cover Rock, Gravel, Grass). The slopes of the dam, including those protected by rock or gravel, must be carefully watched for settlement or erosion. Slopes shall be kept free of debris; rock and gravel slopes shall be kept free of vegetation.

(2) Burrowing animals constitute a hazard to any embankment. Although there is little probability of rodent holes beneath a rock-fill which is bedded on gravel, the project manager should watch for rodents around the slopes and destroy them by poison and traps. Gravel slopes shall be maintained in a smooth even plane.

(3) Protection Stone. Protection stone of all types shall be kept free from debris and vegetation; dislodged stones must be promptly replaced.

(4) Grassed Slopes. Periodic inspections shall be made of all grassed slopes and other grassed areas to note subsidences, slides, erosions, etc. Corrective action in the form of drains, pervious blankets, incipient failures are of substantial magnitude. All grassed areas shall be mowed at least once a year. On many areas it will be necessary to mow two or more times a year to keep up the appearance and discourage the growth of weeds. When necessary to reestablish turf, the seeding operations will start at the earliest practicable date in the spring or fall to obtain the greatest possible protection against erosion. Areas requiring seeding shall be dressed to proper grade, and irregularities in the surface removed. The surface should then be raked or harrowed parallel to the contour of the slope (never up and down) to a depth of three-quarters of an inch. Debris shall always be removed promptly; deposits of debris are unsightly, detrimental to the growth of grass and encourage the nesting of rats and other burrowing animals.

(5) Gutters. These shall be kept in effective condition with displaced rock promptly replaced. Principal hazard is from erosion at edges, caused by flows beyond the capacity of the gutter or by blockage. Failure is progressive and rapid.

(6) Observations shall be made for potentials for major rock falls or slides in spillway and outlet works where blockage may result. Report such potential falls promptly to Operations Division and Basin Manager.

(7) Embankments and Fills. Visual observation by employees working on or near embankment fills for erosion, slides, settlement, springs, boils and other unusual conditions. Close inspection yearly of embankments and fills to detect leaks, settlement, excessive erosion

and slides. The embankment and fills should be maintained to original grade and alignment. Repair depressions or washouts that might tend to weaken the embankment or fill.

b. Interceptor Pipe Drains. Pipe drains run along the access road and the access road extension-service road. The underdrains shall be inspected at least once a year to determine if sections are broken or partially or fully filled. Where drains were constructed in straight runs between manholes and drop inlet and risers, one method is by placing a light in an observation riser and detecting the condition of run by placing a sloping mirror or by visual observation in adjacent inlet or manhole. For other runs, they can be best inspected by noting the flow or rise of water in observation risers. If water rises in one observation riser, a restriction is indicated. Report any indication of filling or obstruction to the Basin Manager.

c. Observation Risers. Inspect and check as covered in b above.

d. Inspection During Floods. (1) The behavior of the dam during floods is of vital importance and interest. Periods of storage are the times of danger and, if weaknesses develop, it is essential that they be noted and prompt corrective action taken. The project manager must recognize that a condition which is of minor importance with a relatively low head may assume serious proportions with increasing pool levels, and he must be constantly alert to note and report even minor failures or changes in the conditions of the embankment. Results of a single careful inspection of the embankment during a flood can be more significant and valuable than a great number of equally careful inspections when the embankment is not impounding water.

(2) When the reservoir is filling or is storing water, the project manager will inspect the exposed faces of the dam with particular attention to the downstream faces of dam, the dam abutments and the areas adjacent to downstream faces of dam for "springs", sand boils, subsidences, sloughing of embankment or abutments, or other indication of leakage through, around or under the dam. Any evidence of increased flow from new "springs" or the movement of soil particles shall be immediately reported.

(3) When the reservoir is being drawn down, the project manager will inspect the exposed faces of the dam, with particular attention to the upstream face of dam and the dam abutments and the area adjacent to downstream face of dam for slides or indications of incipient slides. The project manager will also observe if there are any slides or sloughing of bank in reservoir areas. On the dam proper, the guard rails on top of the dam, if well aligned, will provide a means to detect lateral movement of the dam top that may precede a slide. Any evidence of slides or incipient slides shall be reported immediately.

(4) During the first filling of the reservoir, and each time the reservoir is filled to a higher level than previously experienced, inspection of the downstream face of the dam shall be particularly detailed and conducted at least twice daily during storage and at least three times weekly during drawdown until two weeks after completion of drawdown. During subsequent filling, storage and drawdown periods, inspections of the embankment may be conducted less frequently, but when above El. 940, inspections shall be made once a day during filling and storage and during drawdown.

CHAPTER 3 - INTAKE AND OUTLET WORKS, RETAINING WALLS,  
BUILDINGS, BRIDGE, AND SPILLWAY

a. Concrete and Masonry and Exterior Surfaces - General. (1) Visual inspection by employees working on or near the dam to detect cracks, leaks, collection of ice or heaving of slabs; movement and misalignment of walls, debris formation, displacements, offsets at joints or other irregularities. A close and more complete inspection to detect cracks, leaks, spalling, and deterioration of concrete or masonry will be made semi-annually. Normally, concrete and masonry structures required only limited maintenance; however, when failures occur, report conditions to Basin Manager so that timely repairs can be made by others in order to prevent serious damage requiring replacement or costly repairs.

(2) Expansion Joints. Visually inspect annually for signs of leaks, defective joint material or faulty water stops. Clean joints and fill with filler as required. Report required repairs as necessary.

(3) Concrete. The concrete structures shall be carefully inspected at intervals of six months and after each major filling operation. In addition the tunnel shall have the interior carefully inspected once every two years. The inspection shall include a survey of the general conditions of the concrete surfaces, noting location and extent of cracks, crazing and spalling, and other type of deterioration or disintegration that may have developed, the accumulation of debris, and other unusual conditions. Surfaces adjacent to cracks shall be inspected for differential movement; similar inspections shall be made of construction and expansion joints. Any point or points of leakage will be noted and the condition of all water passages inspected for evidence of erosion or cavitation. The exposed portion of embedded items and the concrete adjacent thereto shall be carefully inspected. All drain holes shall be cleaned. Any condition requiring or suspected to require corrective action shall be brought to the attention of the Operations Division immediately. The inspection shall be made a matter of record with report submitted to Operations Division, including a sketch showing the location and nature of the defects. All accumulated debris shall be removed at spillway, outlet structure, channels, etc.

(4) Exterior Surfaces. Visually inspect all surfaces annually (except as otherwise stated) to discover cracks, damaged finishes, broken block or brick, faulty joints, missing, warped, or defective siding; check around all openings for cracks and leaks; check around all openings for cracks and leaks; check metal siding for loose nails, defective gaskets or fastenings. It should be noted that exterior surfaces of intake structures will be inspected semi-annually. Project Manager shall repair and replace damaged surfaces to the extent of his ability; report conditions not considered repairable by Project Manager to the Basin Manager.

b. Retaining Walls. (1) In cases where the slopes are confined by a retaining wall, the wall shall be normally inspected every two years except inspection shall be made daily when the pool level is equal to half the height of the dam. Any movement cracks or seepages through or around the wall must be noted and promptly reported.

(2) Inspect once every two years to ascertain irregularities such as stress cracks, settlement, tilting, erosion along top of wall, clogged weep holes, deterioration of wall material, displacement, and undercutting of foundation. Provide good drainage to prevent erosion and scouring at the base and top. Keep weep holes open.

c. Trash Racks. When the flow through the trash racks is at a minimum, trash racks shall be inspected and painted as required. All debris collecting at the racks shall be removed after each operation involving storage of water by removing the debris from the intake channel by boat or otherwise.

d. Stoplog structure. When removing or replacing during operation or maintenance, keep water depth equal on both upstream and downstream faces.

e. Log Boom. The log boom will be inspected monthly for broken logs or evidence of rot near holes that contain the ends of the boom chains, and for damaged cables or chains. When operating during large inflows into the reservoir or when ice is in the river, the log boom will be under stress and must be at full strength at all times. Logs not floating will be placed on concrete blocks to keep them off the ground. Spare boom logs shall be available and shall be stored off the ground. All debris collecting behind log boom shall be removed during inspection and especially after large inflows into the reservoir.

f. Tile Gages. Clean the tile gages regularly to facilitate reading. When cleaning the gages, check for cracking, spalling, or abrasion, and insure that gages are securely in place.

g. Buildings. (1) Roofing and flashing. Close inspection shall be performed semi-annually to detect leaks, loose or missing shingles, blisters, weathered built-up roofing, displacement of gravel, damaged ridge or valley coverings; particularly check plastic flashings at vents, and vertical intersections of roof; check metal flashings and counter flashings for loose seams rusting or galvanic action. Following heavy rains or severe storms check roofing and flashings for leaks, missing or damaged shingles or other damage.

The secret of trouble-free low-cost maintenance is a regular resaturation of the membranes or plies of felt while it is still sound. Gravel or slag surfaced roofs need only spot resaturation where the membrane has become exposed, replacing gravel over the resaturated

area. Open up large blisters and repair to protect underlying plies. Keep roof drains open and roof well drained. Indication of water under membrane should be thoroughly investigated to locate the source and repair immediately. Investigate all cracks or other defects and if more than a single ply is affected, repairs should be made promptly.

(2) Floors. Examine annually, floors (concrete) for cracks, settlement scaling, dusting, pitting and deterioration; (wood) buckling, splintering, loose boards, sagging, loose or missing covering materials; asphalt, quarry, ceramic and vinyl tile floors for condition.

(3) Railings and Metal Work. (a) All metal work on equipment grating, railings, ladders, etc., shall be kept neatly painted. Windows shall be kept well flashed. Front entrance doors shall be examined, particularly on the top, for holes. The metal doors shall be completely sealed to prevent the entrance of moisture which would corrode the door from the inside. All holes shall be promptly sealed. Changes in color shall not be made without prior approval.

(b) Examine supports, treads, railings, grating, anchors and bolts for rust, deterioration and rigidity every two years.

(c) In order to assure that maintenance is adequate and timely, performance of the following is essential:

- Tighten all loose bolts and anchorage items.
- Repair all broken welds and defective members.
- Replace worn or slippery treads.
- Keep all stairways, landings and catwalks cleaned of debris, free of obstructions, grease, and oil and keep hand railing rigid and well secured to base.
- Replace broken catch basin and manhole covers promptly.

(4) Windows, Doors, and Screens. Once each year, check weather stripping, calking around framing, stops, door closers, locks, latches, screens, glazing, hinges and stiles. Following heavy rains or severe storm make an inspection to determine extent of damage to windows and doors. Replace broken glass promptly.

(5) Wood Framing and Sheathing. Every two years, check for dry rot, loose or missing boards or shingles, warped, checking, settlement, leaks, or other irregularities. Make close inspection of floor joists sills and beams for termite damage.

Maintain sufficient ventilation under floor areas to dispel moisture and undesirable odors. Replace or reinforce defective material and treat for termites as necessary.

(6) Gutters and Downspouts. Inspect condition, every two years, of fixed and slip joints, check gutter hangers and spacers for adequacy, tightness, alignment, rust deterioration, clogged strainers or downspouts, leaves or debris.

(7) Interior Walls and Ceilings. Close inspection every two years to detect cracks in plaster, water stains, deteriorated plaster, broken or damaged tile, mildew, broken or damaged wall board or paneling, disfiguration or other damage.

(8) Insect Control. Insects shall be disposed of by periodic spraying and/or treatment.

(9) Stairways, Wood. Check condition every two years of treads, handrails, and anchorage for wear, deterioration and safety conditions.

h. Bridge. The Service Bridge will be inspected periodically by engineering personnel to determine condition of the paint or to note evidences of damage or incipient failure.

i. Sump Pump. Check area drains into sump. Clean area drains, drainage system, and sumps as necessary.

## CHAPTER 4 - UTILITIES

a. Water Supply and Sewer Systems. (1) Observe component of each system weekly for good condition and proper operation in connection with water wells, distribution lines, treatment facilities, etc.

Every year the above systems shall be closely inspected for good condition and proper operation. Drain and clean systems thoroughly, as applicable, to insure satisfactory operation. All pneumatic, fire prevention, and gravity storage tanks come under the above requirement.

(2) Potable Water Tests. All water treated by the Project Manager shall be tested semi-annually for chlorine content. Send sample of water for analysis as required by State or local authority. Where there are no local or State requirements, water shall be analyzed at least semi-annually.

(3) Piping. When in the area of piping, observe for indications of leaks. Where possible examine systems for leaks, excessive corrosion or other damage annually. Inspect pipe covering or coating where provided. Repair or replace piping, covering or coating as needed to maintain good condition. Clean piping system as necessary. Check piping system identifying markers, clean and replace as required.

(4) Valves. When in the area of valves, observe for indications of excessively leaking valve stem, flanges or connections. Inspect valves for leaks and general condition annually. Renew packing if needed. Reseat or replace valve and tighten connections as required. Be sure valve is left in normal operating position.

(5) Plumbing systems. Check annually plumbing fixtures and exposed pipe and pipe covering for leaks, malfunctioning and damage. Check relief valves of hot water tanks.

(6) Sewer systems. Inspect annually grease traps, fixture traps, discharge lines, septic tanks and leaching fields for proper functioning and leaks. Clean septic tanks every 2-3 years or earlier as required.

(7) Water well. Check top of casing semi-annually for damage which will permit surface water to enter; check hand-type pumps for damage or malfunction; drain before freezing weather.

Water from wells or other sources provided for human consumption shall meet State and local requirements. Water tests will be made as required by the State health agency and in a manner approved by that agency. Contaminated wells will be closed to public use. Well will be capped and maintained in a manner to preclude contamination from surface run-off.



b. Heating and Ventilating. (1) General. Observe for proper operation.

(2) Duct Systems. Check duct system for general over-all condition once a year. Tighten loose connections and supports as needed. Clean system as required to maintain good condition.

(3) Louvers and Dampers. Observe louvers and dampers for proper functioning and good condition. Adjust, repair and clean annually or as necessary for good operation.

(4) Air filters. Observe air filters bi-monthly for good condition and proper operation. Replace dirty filters.

(5) Heating and Ventilating Fans. Observe belt drives semi-annually for condition and satisfactory operation. Repair and clean fans as necessary to maintain good operating condition.

(6) Plenum chambers. Observe condition of plenum chambers. Inspect doors for good seals and latches. Repair, adjust and clean as needed.

(7) Heating and Ventilating Controls. Examine all thermostats, step controllers, contactors, etc. annually to determine items are in good condition and operating satisfactorily. Adjust or repair as needed to provide proper operation.

(8) Heating System (Forced warm air). Prior to the heating season, preferable during summer months, the unit heater shall have a complete check-up and cleaning by a qualified oil burner service company. This shall include a complete cleaning of the furnace and oil burner. The oil burner shall be adjusted for proper combustion, electrode setting checked, firing rate and nozzle angle noted, draft regulation adjusted for proper draft over the fire and at the breeching, condition of the combustion chamber noted, stack, fan and limit switches checked, fuel oil filter cleaned or replaced. A complete combustion and efficiency test shall be performed and all data recorded for record. Combustion Test Data Sheet shall be used. Check and oil forced-air-fan and motor. Clean fan blades as needed. Check fan belt tension, tighten same and/or replace same if necessary. Clean or replace air filters as necessary. Check thermostat for satisfactory operation and general condition. Inspect chimney flue, clean out debris as necessary.

(9) Boilers, Steam and Hot Water. At the end of the heating season, drain and flush boiler and refill. Prior to the heating season, preferably during the summer months, the heating unit shall have a check-up and cleaning by a qualified oil burner service company. This shall include a complete cleaning of the boiler and oil burner. The oil burner shall be adjusted for proper combustion, electrode setting checked, firing rate and nozzle angle noted, draft regulation adjusted for proper draft over the fire and at the breeching, condition of the combustion chamber noted, stack, pressure and high limit operating controls checked, fuel oil filter cleaned or replaced. A complete combustion and efficiency test shall be performed and all data recorded for record. Combustion Test Data Sheet shall be used. Check condensate pump and control. Check hot water circulator pump and circulator control. Check hot water circulator pump oil sump and oil as required. Check thermostat for satisfactory operation and general condition. Inspect chimney flue; clean out debris as necessary.

c. Telephone and Radio Equipment. (1) Exterior Telephone Equipment. Observe condition of poles, insulators, pins, hardware, cable messengers, telephone cables and wires, terminal boxes, protectors, etc. Report unsatisfactory condition to Utility Company.

(2) Radio Equipment. During normal project use, observe that equipment is functioning properly. Check condition of antenna and report any required repairs as necessary. Observe conditions of lead-in conductors; report any damage as necessary. See that components of both emergency generator and normal power supply are in good condition. Check condition of remote units, recorders, tone relays, telemarks, etc. for good condition.

## CHAPTER 5 - ROADS, GROUNDS AND RECREATION AREAS

a. Roads, Parking Areas, Trails and Walks. (1) Continuous visual inspection for irregularities such as slides, settlement, rutting, potholes, washouts, pumping; damage to signs, guard rails, abutments, retaining walls, culverts and other hazardous conditions. Hazardous conditions shall be corrected immediately. During or following heavy rains or storms, inspect for flooding, washouts, settlement, slides, fallen trees and other obstructions.

(2) Pavements. Visually inspect all pavements annually to determine the need for repairs to expansion joints, cracked or broken sections, settlement due to failure of subbase or subgrade material, drainage or subgrade, scaling, spalling, abrasions, raveling at edges of flexible pavements, potholes, rutting, shoving, bleeding, weathering surface drainage, wash boarding, and excessive amounts of dust. Perform all seasonal maintenance operations, to extent of available equipment and personnel, such as cold patch repairs, crack and joint filling, etc., at the proper time and according to the best practices in the area for maximum benefits. Roads will be resurfaced and/or sealed with the type of surface originally constructed; Operations Division to be notified through Basin Manager of pavements requiring reconstruction, repair or sealing.

(3) Shoulders and Roadside. Inspect annually all shoulders and roadside for drop-offs from pavements, rutting at pavement edge, proper slope for drainage, proper width, stability, slides, gullying, and obstruction to vision. Shoulders must be maintained with a smooth surface flush with adjoining pavement and to correct slope, width, and section. Keep shoulders and roadside clear of tall weeds and brush. Preserve and plant grass where it assists in preventing soil erosion. Sod, shrubs, or plant vines when grass seed will not grow on eroding slopes.

(4) Walks, Roads and Parking Areas. All gravel and dirt access roads and parking areas in the recreation areas will be maintained in good condition and repair throughout the season. Calcium chloride or other dust retarding agents will be used when prolonged dry weather creates a safety hazard. Bumpers of concrete, stone or wood will be provided in and around the outer edges of parking areas for uniform alignment of and to exclude vehicles from blocking emergency exits or trespassing on grassed areas. Rules and regulations are to be conspicuously posted off parking areas.

(5) Paths and Trails. Throughout the recreation area and reservoir continuing inspection shall determine the brush and trees which have to be removed. This is especially true after flood water impoundment. Low hanging limbs and side brush must be removed. At projects where trails are used during winter months, trail signs and small stream crossings should be inspected regularly.

b. Traffic Services and Signs. (1) Traffic Services. Inspect traffic services annually for legibility, damage, obstruction from view, signs and markers conforming to highway standards as to size and shape; automatic devices operating properly; guard rails, snow fences, and traffic control devices in good repair; road hazards properly marked by signs, lights, or devices and at proper distances from hazard; detours properly marked; traffic lanes plainly and properly marked.

(2) Signs. All rustic directional, warning and project identification signs in recreation areas shall be taken down at the close of the season, stained, lettering repainted, and insignia replaced if required. These signs will be stored under cover. The formula for the stain shall be 1 part burnt umber coloring, 2 parts turpentine and 10 parts boiled linseed oil. Standard highway type metal signs shall be removed and stored also. Replacements and additional signs or posts will be ordered before commencement of the recreation season through the Basin Manager. All wood sign posts in place are to be given a coat of stain, if weathered, before attaching signs. Permanent signs shall be repainted as required.

c. Drainage. Inspect semi-annually for adequacy of drainage systems; stoppage or catch basins, culverts, gutters, ditches, under drains; undermining of headwalls, foundations, road shoulders, abutments; ponding, gullying, and clogged drainage pipe. Existing drainage structures such as catch basins, manholes, ditches, gutters, drainage pipe, and flumes must be cleaned periodically in order that they may be kept free of debris and perform their designed function. As a minimum program, a complete inspection is made in the fall in preparation for the winter season and another in the spring, to determine extent of repairs required. Priority for accomplishing drainage maintenance shall be in accordance with established priorities.

d. Guard Rails and Fences. (1) Untreated wood posts will be painted all white. Creosoted wood posts will not be painted. Decayed wood posts should be replaced and wire cable kept at the proper tension. Plank guard rail posts and rails shall be replaced when unserviceable and rails painted when required. All guard rails and posts shall also be checked frequently and untreated items painted when weathering is observed.

(2) Fences. Inspect annually to determine the need for repairs to gates, locks, and fencing. Fences and accessories shall be maintained to provide the maximum security for which they were designed. Repair all breaks as soon as they are discovered, replace unserviceable gate locks, promptly. To maintain harmony with adjacent areas subject to public scrutiny, painting may be desirable.

(3) Chain link fencing will generally not require painting. If required due to excessive rusting, etc., the Basin Manager should be notified.

e. Grounds. (1) General. Visual inspection for loss or damage to vegetation, need for mowing, insect control, ponding, flooding, erosion, clogged or overgrown streams or drainage system, damaged fences, gates, trees, shrubs and vines.

(2) Improved Grounds. Close inspection annually by experienced personnel for soil deficiencies, damaged trees, shrubs, erosion, and vegetation; need for topsoiling, reseeding, sodding; weed, dust, and insect control; pruning, trimming, planting, and mulching. During or following storms, heavy rainfall, or drought make an inspection for flooding, downed trees, damaged trees, shrubs, vegetation and need for repairs. Improved grounds generally consist of lawns in vicinity of operators quarters and other buildings, all landscaped areas, and recreational areas and should be maintained in keeping with the use and intensity of such use.

a. Grassed areas, under normal conditions, should be mowed during the active growing season to a height of 1-1/2 to 2 inches. Mowing should be not more frequent than necessary to prevent the grass exceeding a height of 3 to 5 inches. Reseeding, weed control, fertilizing, and irrigating should be performed only when the appearance of the grass indicates a need for such treatment.

b. Shrubbery should be trimmed in accordance with the requirements of the species and as needed to present a suitable appearance.

c. Shade and ornamental trees. To avoid frequent re pruning, anticipate tree growth for two to three years and prune accordingly. Remove dead or broken branches or those that extend over buildings and shape to present a suitable appearance.

(3) Semi-improved Grounds. Inspect annually to determine the need for mowing, reseeding, sodding, trimming, pruning, removal of brush and flammable vegetation for under and around wood structures, erosion and dust control; clearing of streams and drainage ditches, and application of fertilizers. Semi-improved grounds consist of roadsides, shoulders, open areas adjacent to lawns and similar areas and which require less attention than do improved grounds. These areas should be mowed with tractor-operated equipment to a height of 2 inches or more when the grass reaches a height of 5 to 7 inches or when excessive uneven growth of grass or weeds becomes unsightly. Reseeding and fertilizing is limited to kind and rate necessary to sustain vegetative cover for the control of erosion by wind and water. Drainage ditches, gutters, and channels should be cleaned of wooded plants, vegetation and other matter that restricts flow, at least once a year.

(4) Unimproved Grounds. Inspect annually to determine the need for erosion and dust control; clearing fire lanes, power and communication lines right-of-way; mowing or of flammable vegetation. Unimproved grounds are areas that do not fall within categories above and require only minimum maintenance. Clear firebreaks and clear under and around wood structures, yearly. Anticipate tree growth for two to three years and remove branches overhanging buildings, roads, power and communication lines accordingly.

f. Change House and Comfort Stations. Roof, exterior and interior are to be inspected regularly for deterioration and signs of vandalism. Major repairs and painting should be scheduled during periods when usage is at a minimum. All doors shall be checked to ascertain that they operate properly and that latches are in good working condition. Facilities will be kept scrupulously clean and all necessary accessories provided the visiting public. Fixtures in latrines and comfort stations shall be cleaned daily and odor suppressants added when required. All holding vaults or tanks should have solids removed and be properly flushed by a Contractor specializing in septic tank service. It is mandatory that pit latrines, holding tanks or vaults in recreation areas be cleaned or pumped out at the end of each recreation season.

g. Picnic Facilities. Picnic tables require periodic cleaning by washing with a detergent. Tables shall be treated to combat grease and similar type stains. Unservicable table tops or seats shall be replaced. Wood tables not anchored will be placed on end during the winter months. Brush and debris shall be removed on a regular basis. Grilles, barbecues, and fireplaces shall be maintained in safe condition and shall be repaired when deterioration is evident. Units beyond repair are to be replaced. In dry season precautions will be taken to cope with fire hazard. Hazardous trees will be trimmed or removed. Aeration of soil should be accomplished in areas where ground has become compacted to a degree that is injurious to trees. Herbicides will be applied as necessary to control noxious plants such as poison oak or ivy. Picnic areas will be maintained in a clean and sanitary condition.

h. Bathing Areas. Sand shall be plentiful and kept free of ruts and holes. Dragging or harrowing will keep the beach area adjacent to the water on an even plane. Constant daily inspection is required to determine if debris, broken glass or other sharp objects are left after periods of heavy usage. Surface water drainage shall not be directed over loose sand beaches. Floats to warn bathers of deep holes or limits of safe swimming are to be installed and properly maintained.

i. Refuse Collection. (1) Visual inspection weekly during the active season to determine the police of area, frequency of collection, and condition of containers. Inspect area following severe storms or flooding to determine extent of damage, loss of containers, or existence of any health or safety hazards.

(2) Trash containers will require emptying and cleaning as frequently as the visitation load dictates. Paint containers inside and out as required and the letters PLEASE stenciled on, using white paint. During the off season, the barrels are to be inverted when stored outdoors.

j. Insect and Rodent Control. Visual inspection to detect breeding places where treatment will be most effective, such as ponds, swamps, and thick tall vegetation. The nature and degree of insect and rodent control will be sufficient to meet requirements of State and/or local health agencies. The extent and intensity of larviciding will be frequent enough to maintain a level of *Anopheles quadrimaculatus* below the level determined acceptable by the State health agency. Drift should be piled and removed during draw-downs for more effective mosquito control areas. Intense public use may require spraying to control insects in picnic areas. The application of chemicals will be confined to refuse collection points and around toilets but not on picnic tables where food could be contaminated. Poison to control rodents will be used in a manner that will not permit harm to public.

k. Snow Removal. During winter months all access roads designated by the project manager shall be kept plowed and sanded. Provide stakes where necessary (in fall) to outline limits of roadways and parking areas to avoid damage to areas and structures beyond limits of pavement.

l. Removal of Dead and Down Timber. The reservoir area, particularly in the lower levels, will be kept cleared of all down and dead timber. This may be disposed of by chipping the slash and the timber which is of no value; it may be cut into four-foot lengths and used by the project manager or, if any merchantable or salable quantities are available, it will be sold by the Supply Division of the Division Office. Chips may be spread as a mulch on slopes above spillway level.

m. Cutting of Wood by Others. All standing timber in the reservoir area, as well as other natural resources, is Government property. Therefore, the project manager is not authorized to permit any person or persons to cut and/or remove any standing timber from the reservoir area or to countenance such removal. Persons desiring to cut wood should be advised to write to the Division Engineer, furnishing details of his proposal, including the information on the size, species, quantity, location, etc., together with an offer.

n. Recreation Facilities. The recreational facilities at the lake and reservoir are managed by the Corps of Engineers. The Project Manager shall inspect all facilities, at least, once a year to ascertain whether the facilities outlined in this and other chapters are being properly maintained.

## CHAPTER 6 - ELECTRICAL AND MECHANICAL EQUIPMENT

a. Hydraulic Operated Gates. (1) (Weekly) When and as conditions allow, each gate shall be tested for satisfactory operation. Hydraulic pump units shall be operated alternately to insure both units are capable of immediate service.

(2) (Quarterly). Check pump couplings, repack with grease if necessary and tighten couplings bolts and anchor bolts. Check the remote gate position indicators against the gate hoist indicators. Indicators should read the same, adjust if necessary. Check four way valves, hydraulic piping, fittings and flange connections for any indication of leakage.

(3) (Annually). Pump motors shall be oiled once each year, or more often if required by the manufacturer's recommendations. The end bearings and the worm in the limit switches shall be oiled with a few drops of S.A.E. 20-W oil.

(4) Observe if there is any vibration during raising or lowering of gates in water.

b. Trolley Hoist and Elevator. (1) Safety and Warning Devices.

(a) Annually. Inspect to see that all safety and warning devices are in service and in a safe and proper operating condition. Project Manager shall prepare a list of all items required to be inspected--this information is available from operating manuals. Repair or replace worn, broken or unsafe operating equipment as necessary.

(b) Semi-Annually. Trolley hoist and elevator used at infrequent and varying intervals shall have a good visual inspection of all safety and warning devices thereon and all devices found unsafe or defective put into a safe and proper operating condition before using the equipment.

(2) Operational Tests. (a) Weekly. All elevator and trolley hoist equipment will be operated a sufficient length of time to determine that the equipment is in a safe and satisfactory working condition and ready for service. These functions include the bridge traverse, the trolley traverse, the raising and lowering of the hook and all its speeds.

(b) Annually. Dynamometer test for trolley hoist as directed by Operations Division.



(3) Trolley Hoist Brakes. (a) Semi-Annually. Inspect brake lining and renew if needed. Check brake drums for scoring. Repair or replace as necessary. Adjust brake and spring tension. Renew springs if stretch indicates fatigue. See that thruster is in good condition. Adjust and repair to assure safe operation.

(4) Elevator Brakes. (a) Quarterly. Check for the condition of the thruster brake lining and spring tension. Make the necessary adjustments to assure safe operation. Brake drum and shoe surfaces are to be kept free of grease and oil at all times.

(b) Two Years. Inspect brake lining and renew if needed. Check brake drums for scoring. Repair or replace as necessary. Adjust brake and spring tension. Renew springs if stretch indicates fatigue.

(5) Shafts, Couplings and Bearings. (a) Annually. Visually inspect shafts, couplings and bearings for indications of excessive wear. Lubricate according to manufacturer's recommendations.

(b) Two Years. Examine shafts and couplings for indication of misalignment. Adjust, repair and lubricate as needed. Flexible couplings shall be repacked with grease according to manufacturer's recommendations. Adjust or replace bearings if clearances are excessive.

(6) Gears and Gear Boxes. Two Years. For open gears, observe, and for enclosed gears, listen for indications of broken or excessively worn teeth, misalignment or improper meshing. Check gear box shaft packing and joints for leakage. Make necessary repairs and adjustments to assure proper operation. Lubricate according to manufacturer's recommendations.

(7) Blocks and Hook. (a) Inspect blocks and hook before lifts. Check safety latch on hook.

(b) Semi-annually. Inspect for indications of bending or stretching of the hook.

(8) Counterweights. (2 years). Inspect to determine that the counterweights are properly secured to cables and that the guides are clear. Inspect cables for fraying, kinks or other damage. Greasing interval for the cables according to manufacturer's instruction.

(9) Rails, Supports and Stops. 2 Years. Inspect for misalignment and obstructions. Check concrete supports for cracks and

spalling, steel supports for corrosion and loose rivets and bolts. Repair, tighten, caulk, etc., as needed to assure safe and proper operation. Check stops for proper condition and security. Repair or adjust as needed.

(10) Trolley Hoist Bridge and Carriage. 2 Years. Inspect framework for looseness and cracks. Check rivets and bolts for tightness. Observe girders for corrosion and indications of misalignment. Take necessary remedial action to maintain in satisfactory and safe operating condition.

(11) Trucks and Wheels. 4 Years. Inspect trucks for slew and condition of metal. Examine wheels for excessive wear and flats. Rebuild or machine wheels as needed. Repair and clean as necessary.

(12) Bumpers. 4 Years. Examine for looseness. See that bumpers and/or stops are properly positioned. Tighten or adjust as necessary.

(13) Elevator and Trolley Hoist Cables. Annually. A good visual inspection shall be made of the cables for kinks, frayed cable and corrosion. Lubricate the crane and/or hoist cables. Clean cables by wire brushing, scraping or blow down with compressed air. Apply lubricant with a stiff brush, passing the cable through a lubricant saturated waste or drip on at a point where the cable opens slightly from bending.

(14) Power Supply Cables. (a) Annually. Visual inspection for condition of cable, plugs and receptacles.

(b) 2 Years. Examine cable, plugs and receptacles closely. Check condition of retractable cable needs and connections to collector rings. Repair as necessary.

(15) Elevator Cars. Annually. Inspect for the general condition of the car, damaged door, defective or worn latches. Check safety gate and devices. Check lighting. Repair as necessary.

(16) Hoists. Annually. Inspect hoisting machinery for elevator trolley hoist to determine general condition. Check for worn or defective links, pins, hooks, cables, and see that components are properly lubricated. Repair or replace excessively worn or defective parts and apply lubricant or preservative, to maintain equipment in satisfactory and safe operating condition.

c. Generators and Motors. (1) Generator and Motor Foundations, Bases or Supports. When making an operational tour, observe for any unusual conditions. For generators, integral horsepower motors and engines, inspect for cracks or other damage. Inspect anchor bolts for indications of looseness. Observe for signs of loosening or damage to dowel pins (if provided). Tighten or repair as necessary.

(2) Standby-Units. Operational. (a) Weekly. The standby unit shall be operated for a period of 1 hour each week to bring engine to operating temperature. Before and after each weekly run, the level of the water in the radiator and the oil in the crankcase shall be checked. After each run, the exhaust piping shall be drained of condensate. The weekly testing of equipment shall be done while the standby unit is being operated, with the standby unit furnishing all the energy. Before, during and after the weekly test operation, operation data will be recorded on Standby Electric Generator Unit Location Form. Any malfunction of the unit shall be repaired if possible by the Project Manager, and reported to the Basin Manager if it can not be repaired. The crankcase oil shall be changed every 100 hours of operation or every six months, whichever is sooner and when the oil is at operating temperature so that complete drainage will result. Replace the oil filter element every other oil change.

(b) Monthly. Once a month a standby unit operational run shall be extended to 2 hours. Carefully inspect the storage battery, air cleaner, oil filter, fuel pump and service according to instructions furnished by the engine manufacturer. Operational data will be recorded on Standby Electric Generator Location Form.

(c) Monthly. Operational Test. Inspect commutator, collector rings and brushes for satisfactory operation. Observe brushes to determine if replacement is required. Inspect condition of commutator and collector rings, polish if grooved or rough. Commutators and collector rings with a good surface and polish should not be disturbed. Wipe commutator and collector rings with canvas.

(d) Antifreeze no longer requires draining at the end of each cold weather season; it may be retained in the cooling system for an extended period dependent on the outcome of a hydrometer test accomplished during performance of scheduled Preventative Maintenance Service on the engine.

(e) Annually. Clean the slip ring and commutator and blow out same with dry compressed air.

(f) Brush Rigging. Annually. Inspect the brush rigging and tighten bolts, screws and connections. Check brush spring tension and brush fit. Replace brushes as necessary.

(3) Motors, Fractional Horsepower. Fractional horsepower motors will be given periodic visual inspection as scheduled by the Project Manager. Attachment bolts or screws tightened. Motors lubricated in accordance with project lubricating schedule. Clean external surfaces, check motor couplings, pulleys and belts, tighten or replace as required.

d. Electrical Equipment. (1) Primary Equipment. No attempt at maintenance of the primary equipment, including transformers shall be made by operating personnel. A visual inspection shall be made and any maintenance or repairs required shall be reported to the Utility Company and the Basin Manager.

(2) All maintenance in connection with the following items will be performed by personnel from Operations Division.

(a) Switchboard Wiring and Generator. Annually. Check switchboard, secondary wiring and generator cables. Check all lugs and connections for tightness. Check ground connections for continuity. Perform insulation tests on all circuits, motors and generator windings.

(b) Knife Switches. 2 Years. Examine for evidence of heating; see that hinges and contacts are in order and that interlocks, if provided, are in good condition. Repair or replace as needed.

(c) Motor Starters. 2 Years. Examine starters for condition. Repair and replace parts necessary to place starter in good operating condition. Check auxiliary contacts and interlocks for proper operation. Check motor control devices for satisfactory operation.

(d) Control Cables (Including single conductor control wiring). Examine monthly exposed sections of cables for signs of overheating, corrosion or other damage to insulation or sheath, supports, and terminations.

(3) Storage Batteries. Monthly. Check for leaking battery cases. Check and record specific gravity of all cells. (Note condition of hydrometer, replace if required). Clean corrosion products from inter-cell connectors and terminals. Add distilled water as needed. Coat connections with a film of battery terminal grease. Follow battery manufacturer's instructions for giving batteries an equalizing charge.

(4) Lighting (as required). (a) Replace burned out lamps. Replace flashing fluorescent lamps as soon as possible. Continuous flashing may damage the ballasts.

- (b) Replace broken parts.
- (c) Clean reflectors and lenses.
- (d) Replace defective switches.

(5) Switchboard and Panels (Annually).

(a) Check all fuses. Keep spare fuses on hand. Locate and correct source of trouble before replacing fuses. Use proper rated fuse. A higher rated fuse will not protect circuit. Do not insert fuse on live circuit because it may arc and cause a poor contact and blow fuse. Make sure fuses are tight with good contact.

- (b) Check breakers for operation.

(c) All connections should be tight. Check all bolts, screws and clamp and tighten if loose.

(6) Readings (Semi-Annually).

(a) Check voltage. Voltage that is too high or too low will affect the life, efficiency and economy of equipment.

- (b) Check motor currents observed with nameplate ratings.

- (c) Check frequency.

(d) Megger all feeders and circuits (by Personnel from Operations Division).

(e) Megger all generator and motor windings (by Personnel from Operations Division).

(7) Interlocks (Annually).

- (a) Check interlocks for proper operation.

- (b) Check padlocks and locks on electrical enclosures.

(8) Rubber Mat. Maintain a clean rubber mat in front of switchboard.

(9) Lightning Protection (Annually).

- (a) Check continuity of ground wires.
- (b) Check flagpole ground.
- (c) Check arrester grounds.
- (d) Check antenna mast ground.
- (e) Check switchboard ground.

(f) Ground wires exposed to mechanical injury should be protected by conduit.

(10) Receptacles (Annually).

- (a) Replace defective units.
- (b) Check ground continuity on grounding type.

(11) Portable Cords.

- (a) Arrange cords so that electrical connection bears no mechanical strain.
- (b) Protect all lamps used with an extension cord with a lamp guard.
- (c) Check insulation and plugs.

(12) Wiring.

- (a) Check for proper support.
- (b) Check insulation for deterioration caused by age, abrasion, moisture, oil, heat or other causes.

(13) Neutral. Check neutral ground on supply. This ground is usually connected to a metallic water piping system on the street side of any meter which could interrupt the continuity of the metallic circuit to ground. Check connections for tightness.

e. Sumps and Sump Pump. Check floats, switches and motor for proper operation quarterly. Repair pumps and accessories as conditions or performance indicate.

## CHAPTER 7 - FIRE PREVENTION

a. General. All fire fighting equipment must be kept in instant readiness for operation at all times. At least four fire rakes will be kept in a place readily accessible.

(1) During times when there is a danger of forest fires, the Project Manager shall be on the alert for fires in the reservoir. He shall be familiar with all sources of water in the reservoir area and during the dry season shall have up-to-date information as to the availability of water. In areas distant from the river, water holes in low areas will be developed to provide a supply. Existing water holes shall be kept well cleaned out. A substantial fence shall be kept around all water holes for purposes of safety.

(2) The dam is provided with a portable fire pump with a complement of accessories and 1-1/2" hose. Observe pump and associated equipment weekly for general condition. This pump shall be assembled with its accessories once a month (except during the freezing weather) and run for a short time. Chapter 1 includes a list of the equipment to be included with the portable fire pumps. All of the equipment given in the list shall be kept in one place and ready for instant use at all times. It must be borne in mind that when this equipment is needed, the personnel sent to get it will be excited and hurried, and unless all the equipment is grouped in one place, some important item may be overlooked resulting in serious delay.

### b. Extinguishers.

(1) Carbon Dioxide (CO<sub>2</sub>) Extinguishers.

Monthly. Visual inspection for proper location and condition. Check seals.

Semi-annually. Weigh units and recharge if weight is more than 10 percent less than normal. See Paragraph c (1) for test.

(2) Dry Chemical Extinguishers.

Monthly. Visual inspection for proper location and condition of extinguisher.

Semi-annually. Inspect chemical for condition. Weigh cartridges to determine charge. Repair and refill as required. See Paragraph c (2) for test.

### c. Testing Extinguishers.

(1) Carbon Dioxide (CO<sub>2</sub>) Extinguishers. Perform hydrostatic cylinder test in accordance with Interstate Commerce Commission (ICC) test procedure;

(a) When emptied by use, if time elapsed since last test exceeds five years, or

(b) When time elapsed since last test exceeds twelve years, or

(c) When corrosion, damage or the like warrant regardless of time elapsed.

(2) Dry Chemical Extinguishers. Return to manufacturer for inspection and test;

(a) Every five years, or

(b) When corrosion, damage or the like warrant regardless of time elapsed.

d. Fire Hose.

Monthly. Visual inspection monthly of nozzles and connections. See that the hose is hung in proper position and place for use in case of fire.

Annually. Test all hose annually except unlined linen hose at system pressure. Defective hose will be replaced with new hose.

5 Years. Test unlined linen hose every five years at 25 pounds higher than normal system pressure.

e. Nozzles and Playpipes. Visual inspection monthly for condition. See that equipment is kept in the proper place for ready use. Repair or replace as needed.

f. Fire Doors. Inspect and manually operate monthly to insure equipment is in good operating condition.

g. Flammable Waste Containers. Observe that containers are in the proper locations; that proper type containers are being used and are in good condition. Observe that lids fit securely. Be sure that flammable waste is properly disposed of.

h. Fire Warning Signs. Observe that adequate warning signs are properly located. Check signs for good condition.

i. Fire Plan and Emergency Instructions. Observe adequacy of posted fire and emergency instructions monthly. Check adequacy, condition, and current status annually. Revise as required.



## CHAPTER 8 - ENVIRONMENTAL PROTECTION

a. Scope. The Project Manager shall perform his operating and maintenance work in such a manner so as to prevent, to the extent practicable, environmental pollution as the result of Government activities as well as activities by others on the Government property. For the purpose of this manual, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires consideration of air, water, and land, and involves noise and solid waste-management, as well as other pollutants.

b. Regulations. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the activities of the Government personnel and others on the reservoir, the Project Manager shall make sure that all people using or working at the project comply with all applicable Federal, State and local laws, and regulations concerning environmental pollution control and abatement, and all applicable provisions of the Corps of Engineers Manual, EM 385-1-1, entitled "General Safety Requirements," latest issue in effect.

c. Air Pollution. Some forms of air pollution control are covered in other chapters such as dust control and maintenance of roads and herbicides and insecticides. Further, EM 385-1-1, "Safety - General Safety Requirements" requires control of air pollution wherever it is a safety and health hazard. Air pollution originating and caused by project operations shall be eliminated or decreased. The Project Manager shall comply with project air pollution standards set forth by Federal, State and local agencies.

d. Water Pollution. Care shall be exercised not to pollute the rivers and to maintain water quality standards. Major sources of water pollution are wastes from floating plant (fuel, oil, grease), herbicides and insecticides, sanitary and other waste disposal from buildings, shops and storage areas, and spillage of fuel, grease, oil, etc.

e. Land Despoilment. Of all forms of despoilment by land equipment, landscape defacement is the most permanent. When a tree is removed needlessly or damaged by burning waste too close to it, repair or replacement takes years. When a fill of the earth, gravel, sand, etc. is made in the wrong place, the environment may be marred for the life of the project. Common land despoilment actions include destruction of land forms and vegetation and pollution of the land by spillage and waste. Outside of recreation and similar areas, care shall be exercised in controlling public travel or usage.

f. Noise Pollution. This area of pollution includes a wide range of causes, from faulty mufflers on equipment to use of explosives. Noise pollution is most serious in congested areas and in enclosed operations. The Project Manager shall make every effort to reduce and control generation of noise detrimental to human environment due to Government activities including control due to a variety of noise producing operation and maintenance machinery and activities.

## CHAPTER 9 - MISCELLANEOUS

a. Mobile Equipment, Tools, etc. (1) General. The maintenance and operation of a flood control dam requires a substantial amount of property, tools and equipment. It is the policy of the New England Division to provide the Project Managers with sufficient tools and equipment to properly maintain and operate the dams, related structures and reservoir with a maximum of efficiency. The Project Manager must bear in mind that the more tools and equipment they acquire the greater their capability of maintenance.

(2) Government-Owned Miscellaneous Gasoline Powered Plants. Test operate each engine weekly. Check general condition of unit during the test operation and repair any deficiencies noted.

Each engine will be given a thorough check biannually by a competent mechanic. Replace excessively worn parts and repair as necessary.

Check oil, water, and fuel before and after each use. After each use clean and service the unit so that it is ready for the next operation. Always fill the gas tank after each use.

On small miscellaneous plant that is seasonal in use, the engines will be drained, cleaned, and properly lubricated for storage during the non-use season. Batteries, if any, for such plant will be placed on a trickle charger, and their condition checked each month.

(3) Miscellaneous Tools. All items should be kept clean and in good working order at all times. Tools with an edge should be kept sharp. Broken handles on axes, shovels, hammers, etc., should be promptly replaced.

b. Motor Vehicle Maintenance. (1) Preventative maintenance on motor vehicles under the jurisdiction of the Project Manager. Maintain equipment as recommended by vehicle manufacturer and as outlined in subparagraph (2) below:

(2) Periodic Motor Vehicle Maintenance Guide. This guide will be used as the equipment requires and in conjunction with the Operator's Manual from the manufacturer.

### (1) Weekly

1. Check
  - Radiator for fluid level and leaks
  - Fan belts for tension and wear
  - Batteries for water level
  - Engine oil
  - Transmission oil if applicable
  - Tires for pressure and abrasions
  - Fuel - keep fuel tank full

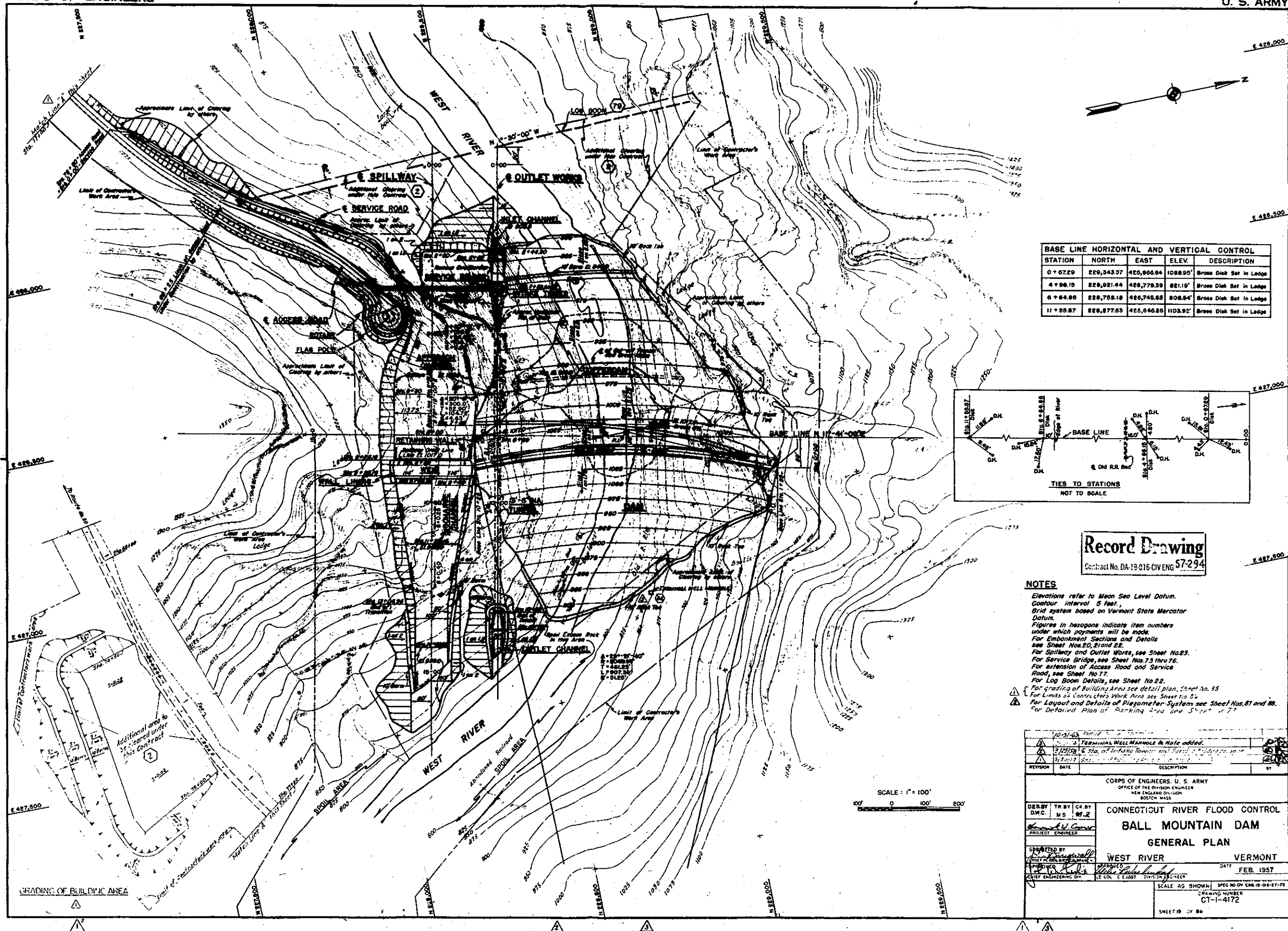
(2) Monthly

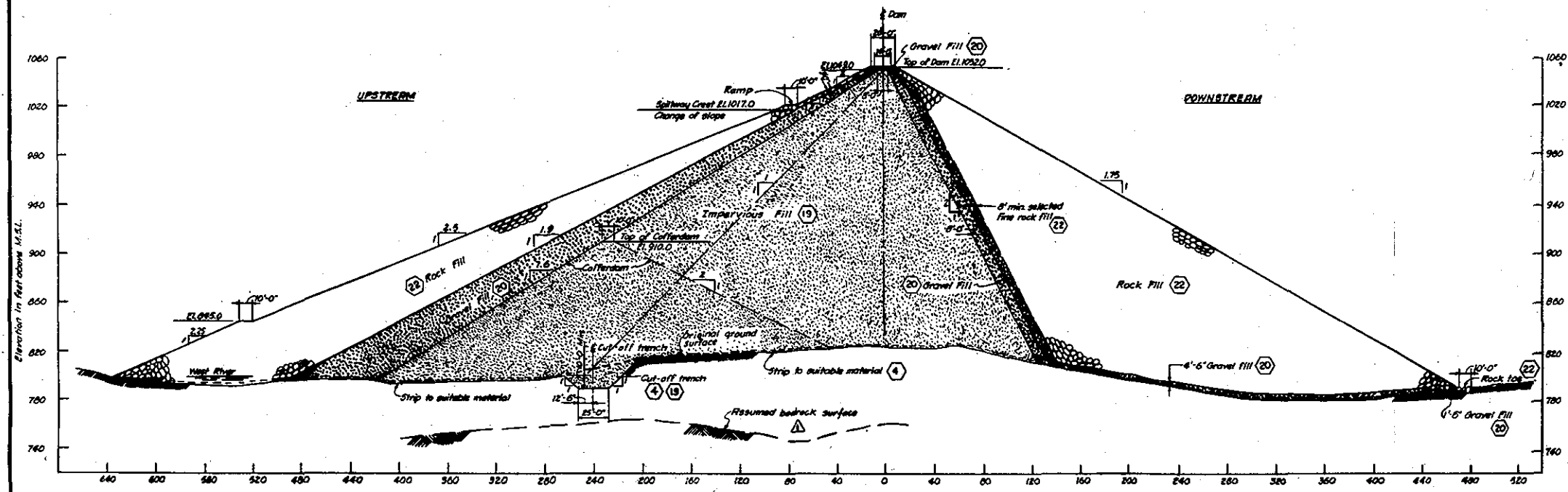
1. Check Weekly items:  
Power steering oil level  
Brake fluid level  
Hydraulic fluid level
2. Service  
Air cleaner

c. Maintenance Records. (1) Maintenance records shall be kept on Card Form #314 as required in Engineer Regulation ER-58-2-1, Change 1, Appendix 11, dated 31 May 1968.

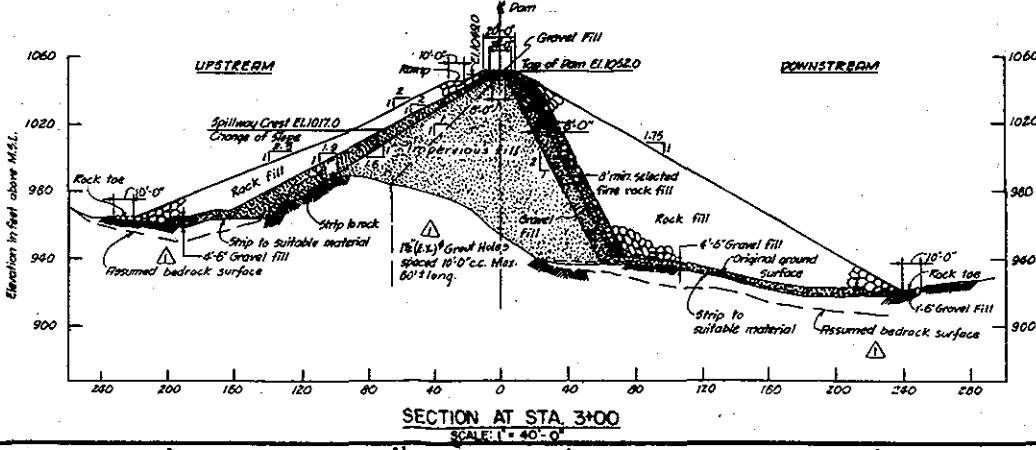
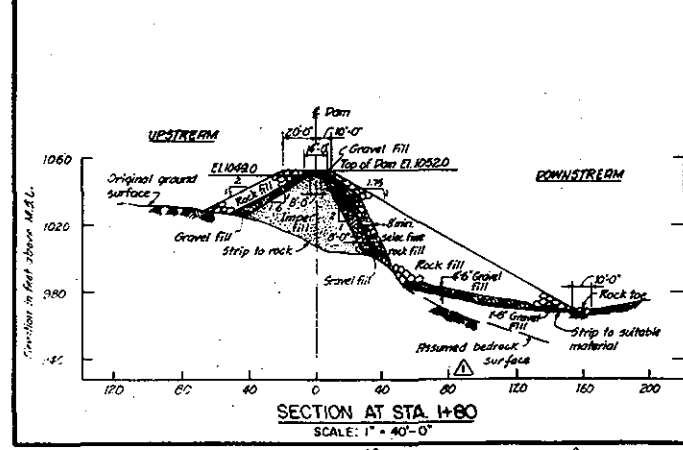
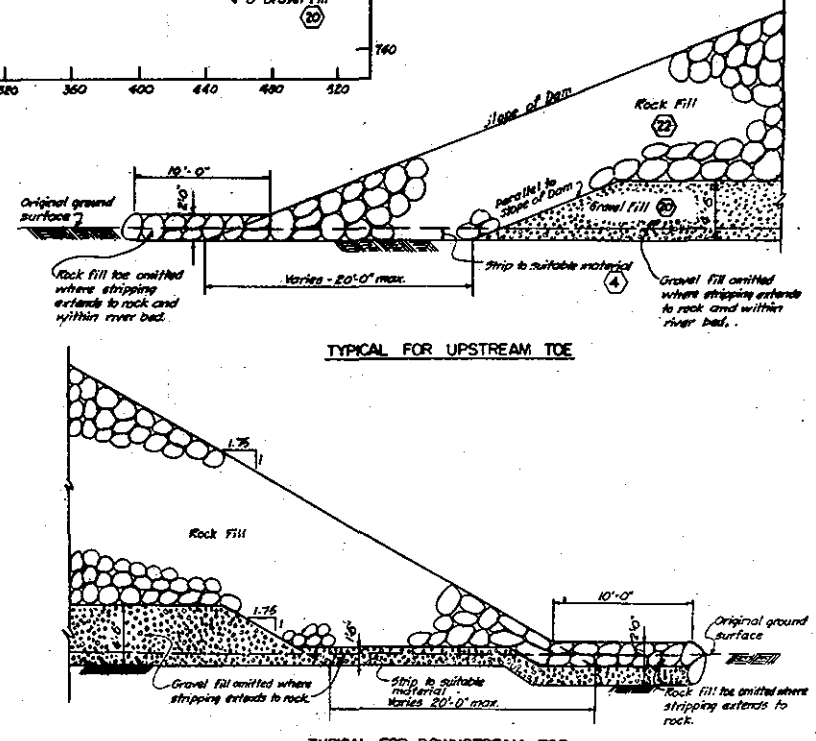
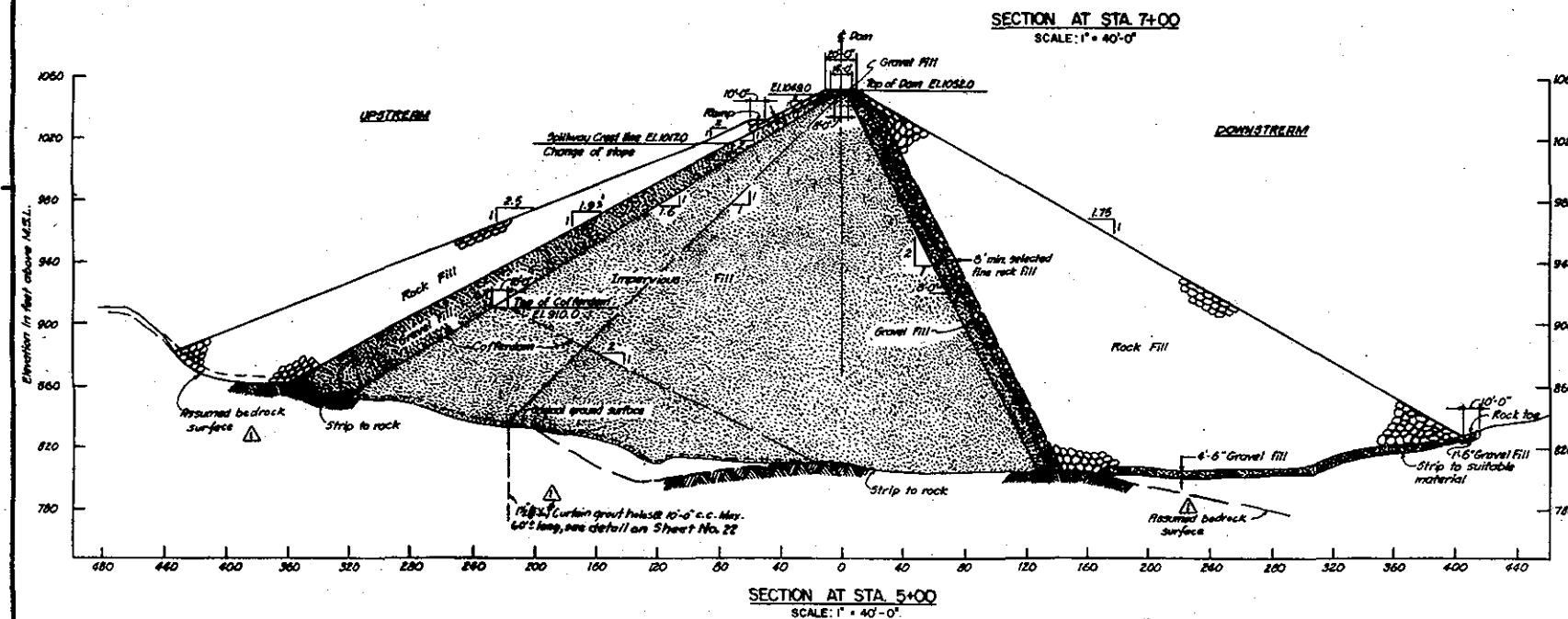
d. Snow Shoes. After the winter period, snow shoes should be wiped clean, the wood and webbing varnished with high grade spar varnish, and stored. Two thin coats of varnish are preferable to one thick one. The shoes should be tied securely, back to back, and a block of wood forced into the space between the toes. They should be placed out of the sun and suspended by a wire so that mice or squirrels cannot get at them.

e. Oil Storage Tanks. Drain condensate from all oil and fuel storage tanks at least once every two years. Clean above ground tanks and repaint or recoat as required. Check liquid level devices for satisfactory operation. Check gage glasses for leaks.





NOTES:  
Elevations refer to Mean Sea Level Datum.  
For general notes applying to this sheet, see Sheet No. 19.  
Sections are normal to center line of dam, at projected  
Base Line stations.  
Figures in hexagons indicate Item Numbers  
under which payment will be made.  
For top of dam detail see Sheet No. 22.



ROCK TOE DETAILS  
SCALE: 1" = 5'-0"

Record Drawing  
Contract No. DA-19-616-ENG-57-294

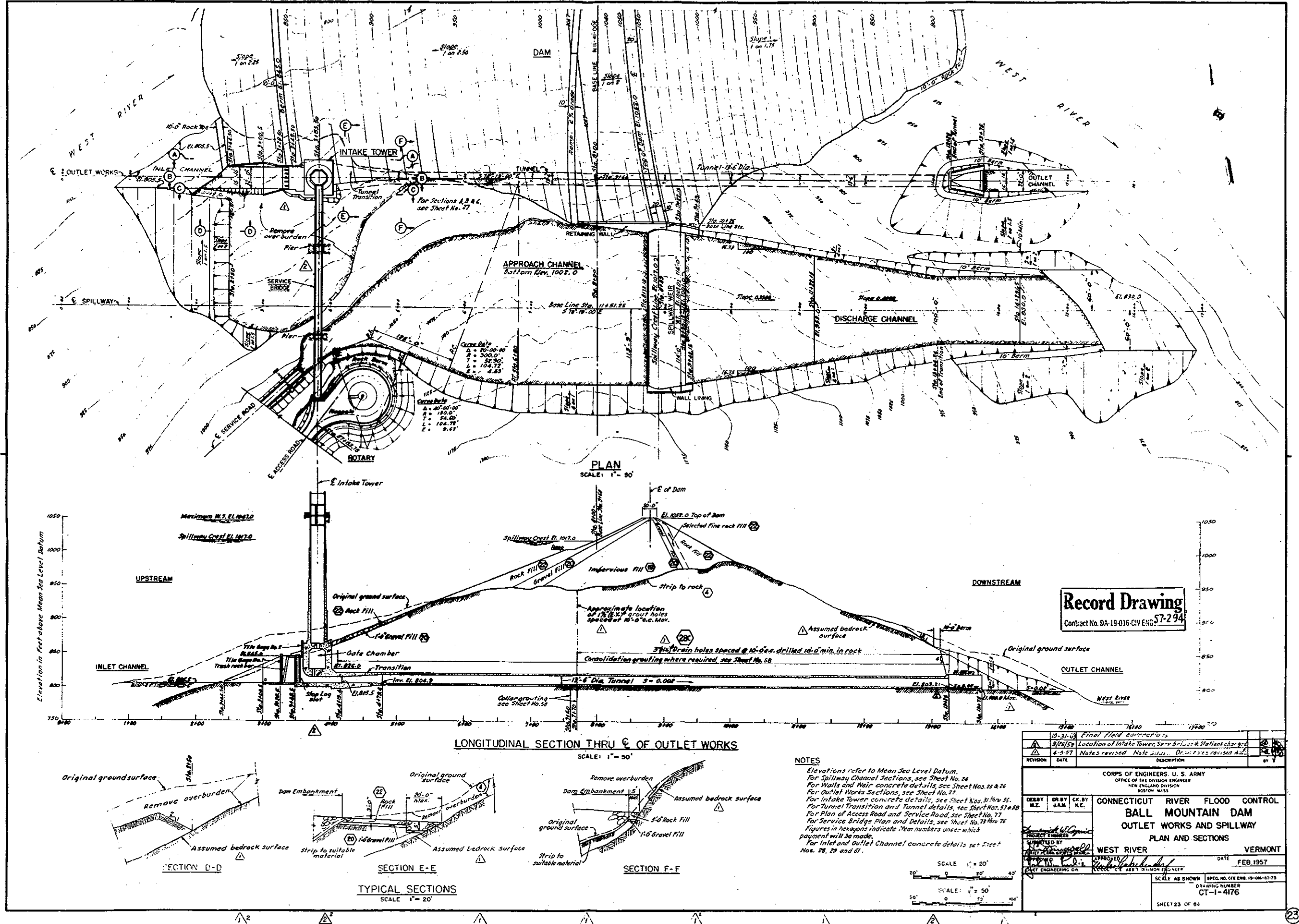
REVISION	DATE	Notes revised	Author	Check
1	6-4-57	Notes revised	Adm. 2	

CORPS OF ENGINEERS, U. S. ARMY  
OFFICE OF THE DIVISION ENGINEER  
NEW ENGLAND DIVISION  
BOSTON, MASS.

DESIGNED BY: [Signature]  
CHECKED BY: [Signature]  
DRAWN BY: [Signature]  
DATE: FEB. 1957

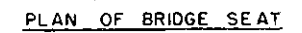
CONNECTICUT RIVER FLOOD CONTROL  
BALL MOUNTAIN DAM  
EMBANKMENT SECTIONS  
WEST RIVER  
VERMONT


SCALE: AS SHOWN (SEE NOTES ON SHEET NO. 19-616-ENG-57-294)  
DRAWING NUMBER: CT-1-4173  
SHEET 20 OF 26





**Record Drawing**  
Contract No. DA-19-016-CIV ENG **57-294**



		Final field corrections Opening Van Intake Louver changed. Roof hatch revised. Phantom lites removed. Roof scupper added. Fleet wall 14 1/2" removed.		A-2
10-21-52 9/17/52 9/10/52	REVISION DATE	DESCRIPTION		BY
CORPS OF ENGINEERS, U. S. ARMY OFFICE OF THE DIVISION ENGINEER NEW ENGLAND DIVISION BOSTON MASS				
DES. BY D.E.C.	WR. BY A.B.	CK. BY J.C.	CONNECTICUT RIVER FLOOD CONTROL BALL MOUNTAIN DAM INTAKE TOWER PLANS AT ELEVATIONS 1039.0-1052.5 1068.5 AND 1085.5	
WEST RIVER			VERMONT	
DATE FEB. 1957			DRAWING NUMBER CT-1-4188	
SCALE 3/8" = 1'-0" SPEC. NO. CIV-ENR-19-04-57-73				
SHEET 28 OF 84				